1950

Turnover of Iowa school superintendents during the past forty-five years and its relation to economic trends

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NOTE TO USERS

TURNOVER OF IOWA SCHOOL SUPERINTENDENTS DURING THE PAST FORTY-FIVE YEARS AND ITS RELATION TO ECONOMIC TRENDS

by

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I. INTRODUCTION

In the business world, the problem of turnover of employees, with the ensuing loss in productive efficiency, has been studied continuously or intermittently for many years.

In the public schools, however, little attention has been given to the new faces appearing from year to year in the classrooms and administrative offices. Whenever the problem has been studied it usually has been subject to attack in terms of tenure rather than in terms of turnover. Tenure studies involving life histories of teachers and administrators have been made in the interest of teacher welfare. Turnover studies involving histories of teaching position changes, made in the interest of school efficiency, have been few in number.

The contrasting emphasis in business and education of problems of tenure and turnover may result from differences in objectivity of a criterion of efficiency. In business, efficiency has been in terms of dollars and cents, whereas, in education, no such objective criterion can be identified.

The present study is limited to turnover in the school superintendencies of Iowa during the 45-year period ending with the beginning of the school year 1949-1950.

Although school efficiency is difficult to evaluate, it is apparent that the turnover of school superintendents is of major importance to the effectiveness of public education in Iowa.

Rapid turnover tends to make difficult, if not impossible, (1) long-time ambitious school undertakings, (2) community acquaintance among citizens and superintendents necessary for school progress, and (3) continuity in the basic philosophy of any given school system.

It is a purpose of this study to present the historical facts of turnover of Iowa school superintendents during the past 45-year period. The secular trend during the 45-year period, upon extrapolation, will furnish education implications for the immediate future.

Another purpose of the present study is concerned with the replacement taking place whenever turnover occurs.

When the trends in different types of replacement are traced throughout the 45-year period, implications for pre-service and in-service training can be drawn together with the part that professional advancement depends upon "moving up the professional ladder".

A further purpose of this study is to ascertain the relationship of both turnover and replacement to economic conditions, war periods, and other fluctuations in the 45-year period which may have resulted from legislation effecting education, such as consolidation of schools and certification of superintendents.

A complete census of all school districts in Iowa maintaining high schools during the 45-year period cannot be justified as a random sample of any population, actual or hypothetical, thus making any tests of significance inappropriate. Therefore, no effort has been made to test any statistical hypotheses.

On the other hand, the present study, from a historical treatment of turnover, should provide evidence

from which suitable implications for educational procedure and educational progress can be drawn.

II. REVIEW OF LITERATURE

Superintendent tenure has long been a subject for investigation, but few studies have been made in the area of superintendent turnover. Most of the studies have dealt with the administrators located in limited geographic areas and have been limited to a small span of years.

The main purpose of a study made by Elsbree[1] was the determination and identification of factors contributing to turnover. He studied the teachers in the cities and villages in the state of New York for the school year 1925-1926. He found that the rate for the cities varied from less than 3 per cent to over 33 per cent with a median of 11.03 per cent; for villages the variation was from less than 6 per cent to over 42 per cent, with a median of 16.9 per cent. He stated that two important factors were found which exert a significant influence on tenure, namely, size of city and inbreeding. His study dealt with teaching personnel rather than with superintendents.

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[1] Elsbree, W. S. Teacher Turnover in Cities and Villages of New York State. Contribution to Education No. 526, Teachers College. 1932.

Peterson[1] stated that 581 out of 810 Iowa superintendents, in their last move [1928], had gone to a population center of the same size or had actually moved to a smaller one. Thus, it appears that a "better position" in many instances means only a different position although factors other than the size of the community may make positions in certain schools more desirable than in others.

In 1930 Shannon[2] studied the turnover of city and town superintendents who were listed in the membership of the Annual Yearbook of the Department of Superintendence. His data included the school years 1922-1923 to 1929-1930. Shannon concluded that the median tenure for the country as a whole was about seven years. He reported that there were no particular years in which turnover among superintendents was especially heavy. Since Shannon's study was made during a comparatively normal economic period it is not unusual that he found no particular change in superintendent turnover.

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[1]Peterson, E. T., and others. Teacher Supply and Demand in Iowa. University of Iowa, Studies in Education. Vol. 7, No. 2, p. 464. 1932.

[2]Shannon, J. R. Turnover of City and Town Superintendents. School Executive. Vol. 50, p. 334-335, March, 1931.

Selke[1] investigated the turnover of superintendents in 322 North Dakota schools beginning with the school year of 1922-1923 and closing with the school year 1937-1938. His study was confined to those schools which employ four or more high school teachers. He found that the median period of service was two years, and turnover in the last year of the study was 27 per cent. Six schools had as many as 11 superintendents and two schools had 12 during the 15-year period of this study. About one-fourth of the superintendents remained in the same school system for more than four years. Selke reported that many of the small-school administrators had accepted classroom teaching positions in larger school systems. He also made the observation that ambitious superintendents use the smaller schools as "stepping stones" to better positions in larger systems, both as administrators and as teachers.

An investigation conducted in Nebraska by Scott and Reed[2] in 1940 was concerned with the relationship of salary and teacher turnover for the Nebraska Public Schools for

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[1]Selke, Erich. Why Administrators Change Jobs. The Nation's Schools. Vol. 25, p. 58-60, May, 1940.

[2]Scott, C. W. and Reed, C. H. Salary and Teacher Turnover Relationship for Nebraska Public High Schools, 1938-1939. School and Society. Vol. 51, p. 356-360, March 16, 1940.

the year 1938-1939. They defined teachers as including superintendents, high school principals, supervisors, and teachers. Data for the investigation were collected by questionnaires from a sampling of four-year public high schools. The reasons advanced by the teachers for leaving their positions were classified according to reasons related to salary, reasons not related to salary, and failure of re-election. Their main finding as a cause of teacher turnover in the Nebraska schools was that the salary factor was by far the most important surface cause of turnover and that the boards of education employ teachers to fill turnover positions at salaries which, on the whole, were lower than those formerly paid. These lower salaries may have resulted from widespread use of salary schedules.

In a recent study Thompson[1] found that the turnover in the 486 schools of Minnesota which had superintendents was 10 per cent in the years from 1937 to 1940, but that the number increased in 1943 to 30 per cent. The

[1] Thompson, Anton. War-Time Tenure of Superintendents. The Nation's Schools. Vol. 35, p. 42, June, 1945.

percentages of turnover in schools which employed ten teachers or less varied from 20 to 40 per cent. Thompson ascribed the large turnover in 1943 to the effects of World War II.

The purpose of a recent study made by Swanson[1] was to determine the median tenure of public school superintendents in Iowa for the years 1937 to 1947; also the relationship between tenure and the size of school, and the relationship between tenure of superintendents and that of the teachers in the same school. He concluded that: tenure is related directly to the size of the school system; more than half of the superintendents holding positions in the schools of the state in 1937-1938 were not listed in similar positions in 1946-1947; the turnover of teachers is greater than the turnover of superintendents in any given year. Although no evidence was presented he suggested that turnover might be lessened a great deal if the attitude of educators could be changed toward their positions.

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[1] Swanson, Edward R. A Study of the Tenure of Superintendents of Public Schools in Iowa, 1937 to 1947. Unpublished research. Field Report, Drake University. June, 1948.

Spalding[1] investigated the turnover of superintendents in 42 of the largest cities in the United States. He found that only two who were superintendents in 1932 were holding similar positions in 1947. During this 15-year period there were only 6 men who held positions in more than one of these 42 cities. Spalding suggested that the increase in turnover is caused by an increase in the number of retirements and in dissatisfaction; the average length of term of office is too brief to give continuing leadership; the number of positions vacated because of death, ill health, and retirement indicate possibly that men who have held the positions have been too old when appointed to give continuing leadership. He pointed out that since these are positions of great responsibility in public education and, with few exceptions, pay the largest salaries, there is little opportunity to advance within this group.

The study made by Davis[1] in 1947 investigated the relationship of turnover of school administrators in Iowa during

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[1]Spalding, Willard B. Turnover in Large City School Superintendencies. American Schoolboard Journal. Vol. 115, p. 30-31, December, 1947.

[2]Davis, Boyd A. Relationship Between The Size of Community and Tenure of School Superintendents in Iowa. Unpublished M. S. Thesis. Ames, Iowa, Iowa State College Library. 1947.

an 11-year period ending with the school year 1947-1948 to a few community characteristics. The characteristics he investigated were community size, type of school district organization, farming area, and increasing or decreasing community size. One purpose of this study was to develop a suitable technique for controlling community size when turnover is studied in relationship to other community characteristics.

The distribution of community size in Iowa is non-normal since there are many more small communities than large cities. To overcome this non-normality community size was transferred into logarithms of logarithms which were found to be satisfactory.

It was found that community size and turnover could be studied satisfactorily whenever communities were divided into three groups; with farming communities less than 500 population, town communities with a population from 500 to 2499, and city communities with a population of more than 2500. The use of the three-group classification was justified as a substitute for the more time-consuming procedure of analysis involving the regression of logarithms of logarithms of community size.

When the three-group classification of community size was made it was found that the mean number of superintendents per school during the 11-year period declined about one superintendent from farm to town communities and an equivalent number from town to city communities.

Of the 848 communities in this investigation, 526 or 62 per cent showed growth from the 1930 census to the 1940 census. When the numbers of superintendents were classified according to community growth or decline, turnover was found to be less for the growing communities. However, when community size was controlled the difference in turnover failed to meet the 5 per cent level of significance.

The greater turnover in independent districts over that in consolidated districts was highly significant when community size was controlled.

The differences among the five farming areas were highly significant and became successively more pronounced when size of community was controlled.

The foregoing study, limited to an 11-year period, was too short a time-series to permit an analysis of relationship of turnover to economic trends.

In summary, turnover studies of school superintendents have been few in number and have been concerned with aspects of turnover other than its relation to economic trends.

III. METHOD OF PROCEDURE

The study, here reported, of trend in turnover of superintendents of Iowa school districts maintaining high schools covered the 45-year period beginning with the school year 1905-1906 and ending with the school year 1949-1950. For convenience it was desirable to refer to any given school year with a single year entry. Since most turnover occurs during the summer preceding a school year, it was decided to refer to a school year by listing the year in which the school year began, i.e., the school year 1905-1906 was called 1905. Thus, the study began with the year 1905 and ended with the year 1949.

A. Collection of Data

The data were assembled from the annual Iowa Educational Directory[1] beginning with 1904. The number of school districts maintaining high schools varied from 670 in 1905 to 919 in 1919. A tabulation sheet was

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[1] Iowa Department of Public Instruction. Iowa Educational Directory, School Years 1905-1906 through 1949-1950.

prepared on which was written the name of the superintendent for each of the 45 years for each school district in Iowa.

Any school district which was not operating for a majority of the 45 years was eliminated from the study, leaving 920 school districts with available information during a major portion of the 45-year period.

Because the number of districts has varied from year to year turnover as defined in this study has been reduced to percentages.

Whenever turnover occurred, a replacement ensued. For purposes of this study replacements were classified into three groups, first entrant, re-entrant, and migrant replacement. To obtain the needed information a 3 x 5 card was filled out for each of the approximately 12,000 superintendent positions. These cards were then alphabetized according to the surname of the superintendent. In this manner the superintendent tenure from 1905 to 1949 was available for each of the 6600 individuals who have served as superintendents.

B. Analysis of Trends

The usual methods of trend analysis have been employed. Secular trend has been determined by the method of least squares, usually by assuming a straight-line trend. In one or two instances the trend line assumed has been a log curve. The latter assumption was made whenever extrapolation was desired and whenever, from logical considerations, the trend cannot be less than some irreducible minimum.

Secular trend was eliminated from the turnover series by dividing the turnover for any given year by the trend for that year. The resulting series was adjusted so that the 45-year average was equal to 100.

In a similar fashion, secular trend was removed from economic indexes for the 45-year period.

The relationship of turnover to business cycles and other irregular variations associated with prosperity and depression was found by correlation.

The amplitude of the economic series with respect to depression-prosperity movements was adjusted to agree with

the amplitude of the turnover series by forcing reasonably similar standard deviations in the 45-year period.

The turnover series was then divided by the economic series with the hope that the ensuing series would bring into sharper relief turnover fluctuation not associated with general economic conditions.

C. Economic Index

For the purpose of this study an economic index was developed from three available indexes, namely, cost of living, wholesale prices, and prices received by Iowa farmers.

The cost of living index, more recently called the consumer price index, is prepared by the U. S. Bureau of Labor[1]. With this index consideration has been taken of the cost of various foods, clothing, rent, and other expenses, each weighted according to its importance in the average family budget.

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[1]Economics Statistics Bureau of Washington, D. C. 1950 Mid-Year Edition The Handbook of Basic Economic Statistics. Vol. 4, No. 7, p. 106-107, July 1950.

On first thought this index, in itself, might be considered as satisfactory for use with superintendent turnover. For the purpose of this study, however, certain limitations are noted. The index indicates average changes in retail prices of goods, rents, and services paid by wage earners and moderate-income families in large cities. Since Iowa superintendents, with few exceptions, live in rural communities, some doubt arises with respect to applicability of the index in the present study.

The index of wholesale prices[1], also compiled by the Bureau of Labor, has been based on the wholesale prices of approximately 900 commodities. The importance of each of the commodities in the index has been considered by weighting the price by the quantity reported in the country's market.

The index of prices received by Iowa farmers[2] has been based on the prices of 24 farm products comprising

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[1]Economics Statistics Bureau of Washington, D. C. 1950 Mid-Year Edition The Handbook of Basic Economic Statistics. Vol. 4, No. 7, p. 122-123, July 1950.

[2]Iowa Department of Agriculture. Price Trends as Related to Agriculture in Iowa. Bulletin No. 92.2. 1939.

[2]Prices of Iowa Farm Products. Iowa Farm Science. Vol. 3, No. 8. 1949.

about 98 per cent of all Iowa farm income. This index has the advantage of applicability to Iowa. On the other hand it has been designed for farmers rather than non-agricultural producers such as superintendents of schools.

Table 1

PROPOSED ECONOMIC INDEX

Year	Index	Year	Index	Year	Index
1905	84.4	1920	168.7	1935	76.9
1906	83.8	1921	115.4	1936	77.8
1907	89.3	1922	112.7	1937	81.2
1908	90.0	1923	115.8	1938	72.3
1909	88.3	1924	113.2	1939	70.2
1910	94.5	1925	117.8	1940	70.9
1911	88.6	1926	112.8	1941	78.7
1912	90.3	1927	107.7	1942	90.7
1913	90.8	1928	108.0	1943	98.8
1914	88.9	1929	105.6	1944	99.2
1915	87.1	1930	95.7	1945	100.4
1916	99.7	1931	77.8	1946	112.4
1917	132.7	1932	66.0	1947	132.6
1918	149.8	1933	64.9	1948	139.2
1919	159.1	1934	71.9	1949	127.6

To some extent the farmer and the superintendent mutually prosper. However, it may be that a favorable or unfavorable ratio

of farm prices to cost of living is related to turnover. This index has the further limitation that no index numbers are available for the earlier years in the 45-year series of turnover. The earlier years were estimated from index numbers of hog prices.

The secular trend was eliminated from each of the three indexes and the ensuing series combined weighting each index equally. This economic index, developed for the purpose of this study, was adjusted so that the average for the 45-year period equalled 100. The values for each year are shown in Table 1. It should be apparent from the procedure followed that, in proposed index numbers, the usual secular trend has been removed in order to be of maximum use in the study here reported.

IV. TURNOVER OF SCHOOL SUPERINTENDENTS

In the 45-year period ending in 1949 between 35,000 and 40,000 superintendent-years of service were provided in the public schools of Iowa. To provide this administrative service approximately 6600 different individuals have been charged with the administrative function of Iowa schools. These 6600 individuals have held more than 12,000 superintendent positions during this period. The number of school districts supporting high schools has varied from year to year with an average between 800 and 900 districts.

The foregoing information has two important implications for education. From the standpoint of teacher welfare the old adage that the school superintendency is more of a procession than a profession seems unusually appropriate.

From the standpoint of the thousands of Iowa young people who have spent innumerable years of development-time in the usual twelve-year schooling span, the turnover loss, although more or less intangible, is recognized as a serious problem.

The present study is not a study of tenure with the resulting implications for teacher welfare, but rather a study of turnover which presumably has more important implications for Iowa youth.

There were 920 Iowa school districts maintaining high schools which were in operation during a major portion of the 45-year period covered by this study. Not all of the districts were in operation, however, during any one year. To reveal the extent of turnover, information for the schools not in operation for the entire 45-year period, was adjusted to a 45-year basis as shown in Table 2. The number of school superintendents in the 45-year period obviously is one more than the turnover here indicated. No school in Iowa passed through this period without a change in superintendents, although it was noted that one school would have shown no turnover if the 45-year period would have started and ended two years earlier than the period here reported.

Turnover varied as shown in Table 2 from two schools with a turnover of one to one school with a turnover of

Table 2

NUMBER OF SCHOOL DISTRICTS HAVING HAD VARIOUS AMOUNTS OF TURNOVER OF SCHOOL SUPERINTENDENTS (Adjusted to 45-year Basis)

Turnover	Number of Districts			
	Rural	Town	City	Total
1	0	0	2	2
2	0	0	3	3
3	1	2	3	6
4	1	3	8	12
5	3	1	10	14
6	3	8	20	31
7	5	13	11	29
8	7	16	16	39
9	8	17	6	31
10	24	32	3	59
11	12	38	3	53
12	34	37	2	73
13	24	33	1	58
14	36	32		68
15	40	33		73
16	50	22		72
17	35	10		45
18	40	15		55
19	44	7		51
20	28	6		34
21	21	1		22
22	28	2		30
23	15	1		16
24	18	1		19
25	13			13
26	6			6
27	2			2
28	2			2
29	1			1
30	1			1
Average	16.72	12.59	6.57	14.27

of 30 with an average of 14.3 for the 45-year period. The turnover varied depending upon the size of community as would be expected and as has been indicated by a previous study[1]. As shown in the table, the average school turnover was approximately 16.72, 12.59, and 6.57 in 45 years for schools situated in towns of less than 500, 500 to 2499, and over 2500 respectively during the 45-year period.

A. Size of Community

The percentages of school districts maintaining high schools in which turnover occurred for the 45 years in farm, town, and urban communities are shown in Table 3 and Figure 1.

By inspection it appeared that turnover was greater during years of prosperity and smaller during years of depression. It is not surprising to note the unusually large turnover which occurred during World War II.

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[1] Davis, Boyd A. Relationship Between the Size of Community and Tenure of School Superintendents in Iowa. Unpublished M. S. Thesis. Ames, Iowa, Iowa State College Library. 1947.

Table 3

PERCENTAGE TURNOVER IN RURAL, TOWN, AND URBAN COMMUNITIES

Year	Population				Year	Population			
	Under 500	500 - 2499	2500 or More	State		Under 500	500 - 2499	2500 or More	State
1905	49.62	38.44	23.85	40.90	1930	32.06	23.71	12.50	27.18
1906	47.15	33.23	19.32	36.87	1931	26.25	18.24	9.09	21.72
1907	55.13	40.13	12.50	42.39	1932	22.65	15.50	4.55	18.34
1908	59.02	41.25	18.18	45.25	1933	20.56	13.64	7.95	16.87
1909	54.32	39.32	22.73	43.25	1934	23.80	15.50	6.82	19.19
1910	54.80	40.87	21.59	44.08	1935	24.20	13.98	12.50	20.83
1911	58.04	40.25	25.00	45.62	1936	27.40	13.98	12.50	21.16
1912	54.14	41.18	14.77	43.22	1937	27.00	19.45	10.23	22.68
1913	48.48	42.11	29.55	43.22	1938	24.75	17.33	6.82	20.37
1914	55.52	37.65	18.18	42.76	1939	25.60	13.98	6.82	19.63
1915	45.39	31.90	19.32	36.07	1940	22.29	12.16	10.23	17.49
1916	41.23	34.36	12.50	34.78	1941	22.22	17.93	1.14	18.64
1917	45.64	38.34	13.64	38.79	1942	36.86	20.67	7.95	28.19
1918	60.27	38.77	30.68	52.12	1943	46.69	26.44	13.79	36.11
1919	52.39	40.80	22.73	44.30	1944	40.80	32.32	20.69	35.70
1920	55.50	40.80	15.91	45.33	1945	38.48	23.48	14.94	30.51
1921	49.89	37.31	18.18	41.76	1946	40.13	20.55	20.69	30.73
1922	42.15	35.78	29.55	38.52	1947	39.91	27.61	17.24	32.86
1923	41.04	30.89	9.09	34.19	1948	39.16	21.47	12.64	29.57
1924	43.42	28.66	7.95	34.59	1949	30.07	16.92	6.90	22.54
1925	36.08	22.87	11.36	28.86					
1926	31.21	23.17	15.91	26.80					
1927	28.78	21.65	10.23	24.39					
1928	30.38	19.21	11.36	24.53					
1929	33.40	25.53	5.68	27.90					

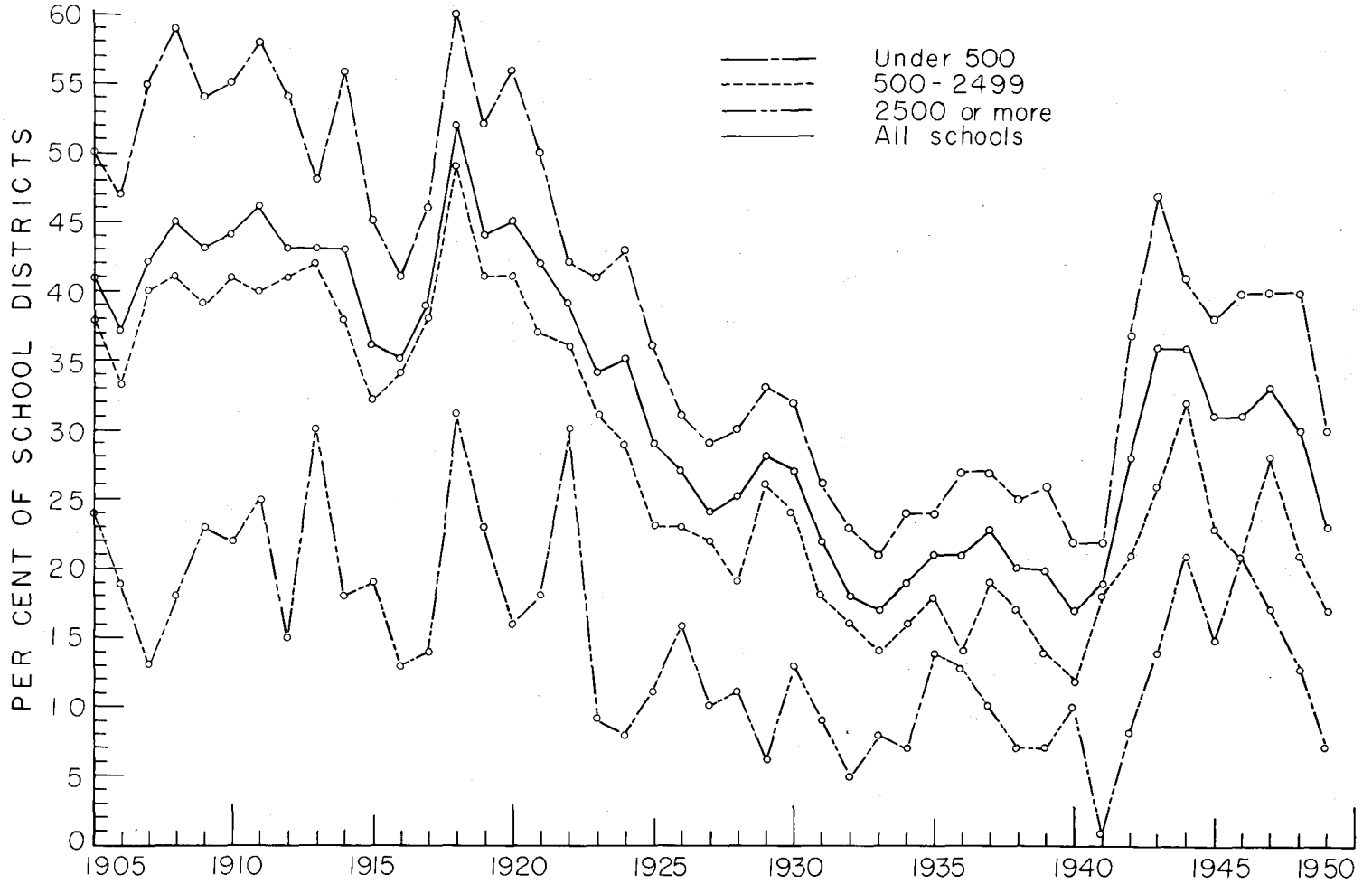

Figure 1 Percentage Turnover of Superintendents Classified According to Community Size.

With all the fluctuations which occurred in the 45-year trend, it is evident that turnover, in general, has decreased during this period with an average yearly turnover of 40, 28, and 15 per cent for farm, town, and urban communities, respectively.

For evaluating the decrease in turnover a linear trend line was developed for each type of community by the usual method of least squares. The equation for a straight line was used

$$Y = aX + k$$

where Y = percentage turnover

X = years since 1927

a and k = constants

The normal equations, by the method of least squares, are

$$\Sigma XY = a\Sigma X^2 + k\Sigma X$$

$$\Sigma Y = a\Sigma X + Nk$$

Because $\Sigma X = 0$, these equations may be expressed in terms of a and k as

$$a = \frac{\Sigma XY}{\Sigma X^2} \qquad k = \frac{\Sigma Y}{N}$$

The data shown in Table 3 for farm, town, and urban communities were substituted in the foregoing equation yielding the following trend lines:

For farm communities (under 500 population)

$$Y = 39.64 - .6253X$$

For town communities (500 to 2499 population)

$$Y = 27.76 - .5938X$$

For cities

$$Y = 14.57 - .2705X$$

where Y = turnover

X = number of years since 1927.

From these trend equations, the average annual reduction in turnover has been approximately 0.62, 0.59, and 0.27 per cent in farm, town, and urban communities respectively.

At the time of this study, annual data were not yet available for turnover for 1950, i.e., the school year 1950-1951. A preliminary list of superintendents prepared by the Iowa State Education Association furnished evidence

of turnover prior to September of 1950. It is assumed that little additional turnover will occur from this date until the annual directory is published late in 1950.

The tentative percentage of turnover for 1950 in communities under 500 population was 29.69 per cent, or 10 per cent less than the 45-year average in this type of community. This 1950 turnover, however, was greater than that occurring during the depression years of the 1930's. When 1950 was substituted in the trend equation, the predicted turnover for 1950 was 25.26 per cent. Thus the 1950 turnover in farm communities was 4 per cent greater than that suggested by the 45-year linear trend.

The tentative percentage of turnover for 1950 in communities between 500 and 2499 population was 15.08 per cent, more than 12 per cent less than the 45-year average. A comparison with annual turnover shown in Table 3 pointed out that the 1950 turnover, however, was greater than that noted during the depression. When 1950 was substituted in the trend equation for communities of this type, a predicted turnover of 14.11 per cent was found which was only 1 per cent less than the tentative percentage turnover.

The tentative percentage turnover in cities in Iowa (2500 or more population) was 3.45 per cent. This turnover was far below the 45-year average of 14.57 per cent. In fact, in only one year, 1941, was the turnover as small as that indicated for 1950. When 1950 was substituted in the trend line for city communities, a predicted turnover of 8.35 per cent was found. The tentative 1950 turnover was almost 5 per cent less than would be suggested by the 45-year linear trend.

A longitudinal study, such as this one, probably should control upon community size. However, such classification was not undertaken since populations were not constant throughout the 45-year period. The data shown in Table 3 were based upon the populations shown in the Sixteenth Census [1940].

Hereafter all communities regardless of size have been combined for purpose of turnover analysis.

B. Trend in Turnover

The purpose of the present study is to trace in a historical sequence turnover changes by years with the

thought of noting concurrent changes in economic conditions, periods of war, and legislative action.

The percentage turnover by years is shown in Table 4. An inspection of this turnover reveals that the all-time high was in 1918, when more than one-half of the schools in Iowa had a superintendent who had not been in that position in 1917.

The lowest turnover, in 1933, was less than 17 per cent which, even then, represented one turnover for every seven schools.

When all years were considered the average turnover was 32.24 per cent, or approximately one school in every three had a change in administrative personnel with the inherently possible accompanying loss in continuity of an educational program.

Any number of possible proposals could be advanced with respect to the over-all trend in turnover. By far the simplest of the proposals is that any changes that

Table 4

TREND IN TURNOVER OF SUPERINTENDENTS IN IOWA SCHOOL DISTRICTS

Year	Turnover	Trend		Year	Turnover	Trend	
		Linear	Log			Linear	Log
1905	40.90	43.64	44.33	1940	17.48	25.50	24.37
1906	36.86	43.13	43.48	1941	18.64	24.98	24.02
1907	42.39	42.61	42.66	1942	28.20	24.46	23.67
1908	45.25	42.09	41.86	1943	36.11	23.94	23.34
1909	43.26	41.57	41.08	1944	35.70	23.42	23.00
1910	44.08	41.05	40.31	1945	30.51	22.91	22.69
1911	45.62	40.53	39.57	1946	30.74	22.39	22.38
1912	43.22	40.01	38.84	1947	32.86	21.87	22.08
1913	43.22	39.50	38.13	1948	29.58	21.35	21.78
1914	42.76	38.98	37.44	1949	22.54	20.83	21.49
1915	36.07	38.46	36.77	1950		20.31	21.20
1916	34.78	37.94	36.11	1951		19.79	20.92
1917	38.78	37.42	35.47	1952		19.28	20.66
1918	52.12	36.90	34.84	1953		18.76	20.40
1919	44.31	36.39	34.23	1954		18.24	20.14
1920	45.34	35.87	33.63	1955		17.72	19.89
1921	41.76	35.35	33.05	1956		17.20	19.65
1922	38.53	34.83	32.48	1957		16.68	19.41
1923	34.19	34.31	31.93	1958		16.17	19.18
1924	34.59	33.79	31.40	1959		15.65	18.96
1925	28.85	33.27	30.87	1960		15.13	18.74
1926	26.80	32.76	30.35	1961		14.61	18.52
1927	24.39	32.24	29.86	1962		14.09	18.31
1928	25.54	31.72	29.36	1963		13.57	18.11
1929	27.90	31.20	28.90	1964		13.05	17.91
1930	27.19	30.68	28.43	1965		12.54	17.71
1931	21.72	30.16	27.98	1966		12.02	17.52
1932	18.34	29.65	27.54	1967		11.50	17.34
1933	16.87	29.13	27.10	1968		10.98	17.16
1934	19.19	28.61	26.68	1969		10.46	16.98
1935	20.82	28.09	26.26	1970		9.94	16.81
1936	21.15	27.57	25.87	1971			
1937	22.69	27.05	25.48	1972			
1938	20.37	26.53	25.10	1973			
1939	19.63	26.02	24.73	1974			

take place are a linear function of time, i.e.,

$$Y = aX + k$$

where Y = percentage turnover

X = years removed from series middle year (1927)

a and k = constants.

The normal equations, by the method of least squares, are

$$\Sigma XY = a\Sigma X^2 + k\Sigma X$$

$$\Sigma Y = a\Sigma X + Nk$$

Because $\Sigma X = 0$, these equations may be expressed in terms of a and k as

$$a = \frac{\Sigma XY}{\Sigma X^2} \qquad k = \frac{\Sigma Y}{N}$$

Upon substitution of the data shown in Table 4 the equation for predicting turnover from year (deviation from 1927) became

$$Y = 32.44 - 0.51846X$$

From the foregoing equation it could be inferred that turnover on an average had been one-half of one per cent decrease in each succeeding year. The foregoing equation,

useful though it may be for interpolation, may become quite unsatisfactory for extrapolation whenever inferences of that kind are desired.

Turnover of less than zero is inconceivable. With the foregoing equation the year at which negative turnover would be suggested may be found by substituting zero for Y and solving for X. Thus,

$$0 = 32.24 - 0.51846X$$

Solving $X = 62.18$

Since X equals the number of years before or after 1927 the year 1990 would be the first year in which turnover would be predicted to be a negative value.

The equation of a straight line admits of no irreducible minimum. Such an assumption may be avoided by assuming some kind of a curvilinear relation with an arbitrary irreducible minimum.

For purposes of this study an irreducible minimum of 10 per cent was chosen. Admittedly this minimum value is highly arbitrary. Some turnover will exist in the future

even under the most ideal tenure and turnover conditions. Death and retirement would produce an approximate 5 per cent turnover. The amount of turnover under ideal conditions resulting from professional advancement is more difficult to forecast, but has been assumed to be 5 per cent. Thus an irreducible minimum of 10 per cent has been postulated. A trend equation asymtotic to 10 per cent has been chosen of the type

$$\text{Log } (Y-10) = aX + k$$

where Y = turnover

X = year minus 1927

a and k = constants

The method of least squares provide normal equations of

$$\Sigma X \log (Y-10) = a\Sigma X^2 + k\Sigma X$$

$$\Sigma \log (Y-10) = a\Sigma X + Nk$$

Since $\Sigma X = 0$, for the 45-year period

$$a = \frac{\Sigma X \log (Y-10)}{\Sigma X^2} \qquad k = \frac{\Sigma \log (Y-10)}{N}$$

When the turnover information was substituted in the foregoing equations, values of a and k produced the trend equation

$$\log (Y-10) = 1.29794 - 0.010807X$$

Turnover and the logarithmic trend are shown in Figure 2. By inspection the trend line from 1904 to 1949 approximates a straight line. The greatest discrepancies in the 45-year period between straight line and logarithmic trend would be noted for the years 1905, 1927, and 1949. The predicted turnover for these years was found by substituting in the two equations X values of -22, 0, and 22, respectively. The turnover values from the trend lines assumed are

Year	Straight Line	Log
1905	43.6 per cent	44.3 per cent
1927	32.2 per cent	29.9 per cent
1949	20.8 per cent	21.5 per cent

For purposes of extrapolation beyond 1949, the logarithmic trend appears more logical. The projected trend to 1970 is shown in Table 4 and Figure 2.

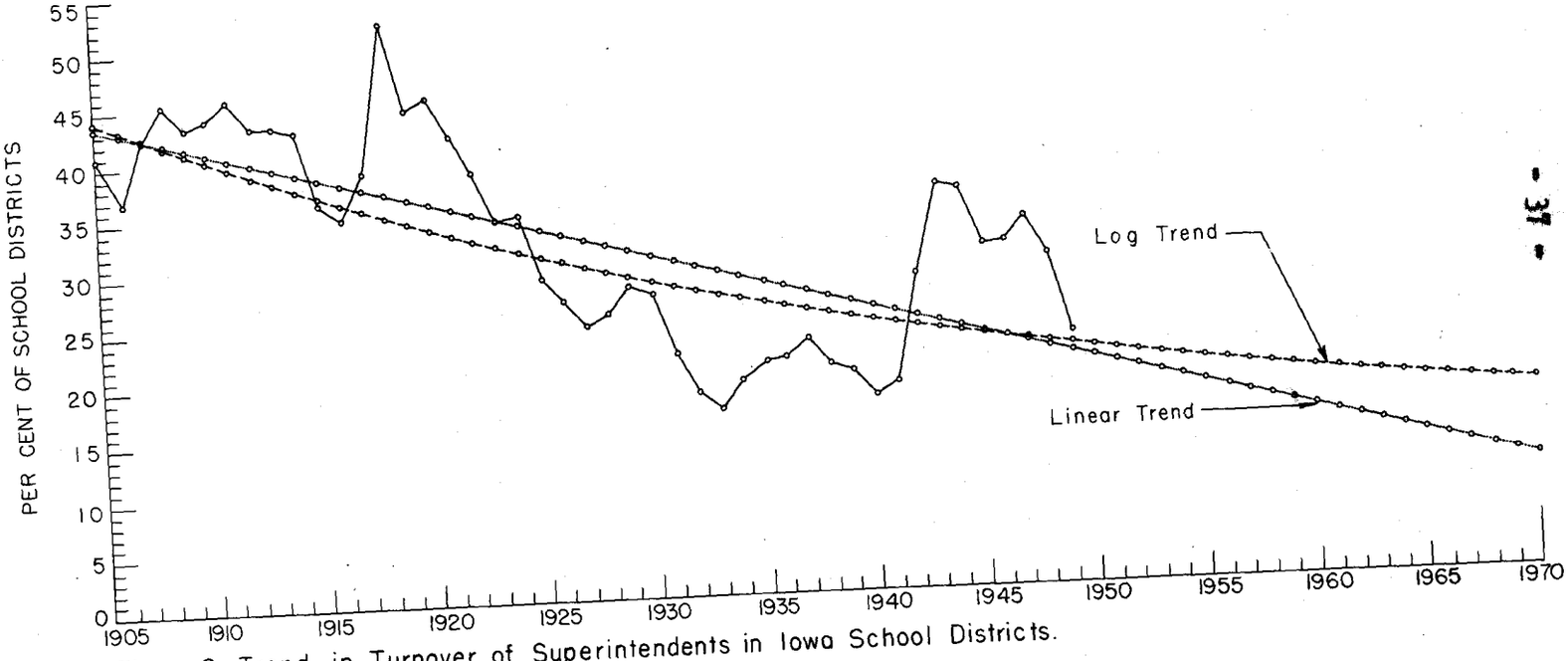

Figure 2 Trend in Turnover of Superintendents in Iowa School Districts.

During the 45-year period fluctuations from the trend line are apparent. Turnover was small during the depression and large during war periods. A much larger turnover was noted during World War II than during World War I. This greater turnover may have resulted from the more complete mobilization required during World War II, although it may have been influenced by a greater number of young men of military age holding superintendencies during World War II than during World War I. Draft regulations gave almost no recognition to teaching as an essential occupation during World War II.

School legislation, school consolidation, and inauguration of other educational programs could not be identified with fluctuations from the trend line. It is probable that such factors are related to turnover, but their effects are gradual rather than immediate as expressed in changes in turnover.

C. Relationship to Economic Conditions

Trend analysis usually consists of identification of secular trend, periodic, cyclical, and irregular movements.

The secular trend in turnover was assumed to be in the form of a log curve and has been removed by dividing the turnover for any given year by the trend line value for the same year.

Periodic movements are those variations in a time series which repeat themselves with unusually regular intervals of not more than annual duration. It is well known that the trend in turnover of superintendents presents such periodic movements. Most turnover occurs during the spring and early summer months with little turnover during the fall and winter. Since the data here used have been on an annual basis, such periodic movements are not shown in the turnover, and, for the present study, may be disregarded in the analysis.

Economic cycles are a type of fluctuation lasting longer than one year which tend to reoccur with more or less regularity. No attempt will be made to prove or disprove the regularity of such cycles. During the last 45 years, periods of depression and prosperity have appeared on the business scene and are reflected in indexes of economic conditions. Usually such cyclic

movements are more apparent after secular trend has been removed from the time series. The index of economic conditions with secular trend removed, here developed and shown in Table 1, represents a composite of cost of living, farm prices, and wholesale prices. This economic index has a 45-year mean of 100 and a standard deviation of 24.19.

The foregoing economic series includes not only cyclical movements but also irregular variations associated with wars or other incidents related to prosperity and depression. For the purpose of this study, no attempt will be made to segregate these irregular variations from cyclical movements.

The turnover series with the secular trend removed is shown in Table 5. The entries are in the form of index numbers with the 45-year average set at 100. An inspection of these data indicated some agreement with known depression-prosperity periods. However, variations from a smoothed curve were more pronounced in the turnover series than in the economic series. Since the analysis to be made consisted of dividing one series by the other, it was essential that the amplitude of the two series be reasonably similar with respect to the depression-prosperity movement. Since

Table 5

ECONOMIC CONDITIONS AND TURNOVER OF IOWA SCHOOL SUPERINTENDENTS

Year	A	B	C	D	Year	A	B	C	D
1905	40.90	88	86	101	1930	27.19	92	96	95
1906	36.86	81	85	94	1931	21.72	74	79	93
1907	42.39	95	90	104	1932	18.34	64	69	92
1908	45.25	103	91	112	1933	16.87	60	68	87
1909	43.26	101	89	112	1934	19.19	69	74	92
1910	44.08	105	95	109	1935	20.82	76	79	95
1911	45.62	110	89	122	1936	21.15	78	79	98
1912	43.22	107	91	116	1937	22.69	85	83	101
1913	43.22	109	92	117	1938	20.37	78	74	104
1914	42.76	109	90	120	1939	19.63	76	72	104
1915	36.07	94	88	106	1940	17.48	69	73	93
1916	34.78	92	100	91	1941	18.64	74	80	91
1917	38.78	105	130	80	1942	28.20	114	91	124
1918	52.12	143	146	97	1943	36.11	148	99	148
1919	44.31	124	155	79	1944	35.70	149	99	149
1920	45.34	129	164	78	1945	30.51	129	100	128
1921	41.76	121	114	105	1946	30.74	131	111	117
1922	38.53	114	112	100	1947	32.86	142	130	108
1923	34.19	103	115	89	1948	29.58	130	136	95
1924	34.59	105	112	93	1949	22.54	100	126	78
1925	28.85	89	117	75					
1926	26.80	85	112	75					
1927	24.39	78	107	72					
1928	24.54	80	107	74					
1929	27.90	92	105	87					

A = Turnover (percent)
B = Secular Trend Removed (45-year average = 100)
C = Index of Economic Conditions (σ = 22.41) (45-year average = 100)
D = Economic Conditions Removed (45-year average = 100)

the turnover series presented a smaller serial correlation than the economic series, a three-year moving-average was made of the turnover series and the amplitude then computed yielding a standard deviation of 22.41. The economic index was then adjusted to a standard deviation of 22.41 and is shown in Table 5.

An inspection of the economic index and turnover index indicates a positive relationship of cyclical movements and irregular variations to turnover. The coefficient of correlation with identical years paired, i.e., with no lead or lag, was found to be 0.66. Coefficients of correlation were also computed when one series was advanced or set back for one year with coefficients of correlation of 0.64 and 0.55. Thus no lead or lag in turnover and economic index was indicated when identical years were correlated.

It is difficult to evaluate the possibility of lead or lag within identical years. As previously noted, turnover within any given year is known to be a highly seasonable characteristic. The exact date of turnover was not available. Even under circumstances of all incidents being

known, the exact date of turnover may be open to question. Does turnover take place (1) when a superintendent resigns, or (2) when another superintendent is elected, or (3) when the superintendent-elect first assumes some responsibility for the school program of the ensuing year, or (4) when the out-going superintendent leaves, or (5) when the superintendent-elect moves to the community? Arbitrarily July 1st was selected as the date of turnover. Entries in all tables here shown for any given year represent the turnover reported in the Iowa directory usually published in November. Thus, the 1949 turnover was ascertained by noting the changes from the school year of 1948-1949 to 1949-1950. The economic indexes are yearly averages and as such probably can be assumed to represent July 1st. On the basis of the foregoing evidence, some justification exists for the inference that no lead or lag exists whenever identical years are paired.

The turnover series was then divided by the economic series and the resulting series adjusted to a 45-year average of 100, yielding a turnover series in which presumably economic conditions have been removed. This series,

shown in Table 5 and Figure 3, indicated that during the 1920's and 1930's the turnover was less than expected when allowances were made for varying economic conditions.

A distinct contrast is noted between expected turnover during World War I and World War II. In the former the turnover was approximately normal, or slightly below, whereas in the latter the turnover was much above normal.

Several hypotheses may be advanced for the discrepancy in turnover between the two wars. First, the war effort was much more widespread and of longer duration in World War II than in World War I. Second, war industry touched Iowa but little during World War I. Third, turnover values shown during World War II are biased since price control tended to keep down the size of the index during the war years.

School legislation, school consolidation, and inauguration of other educational programs are no more apparent than before allowances were made for economic condition. The foregoing in no way denies that educational legislation

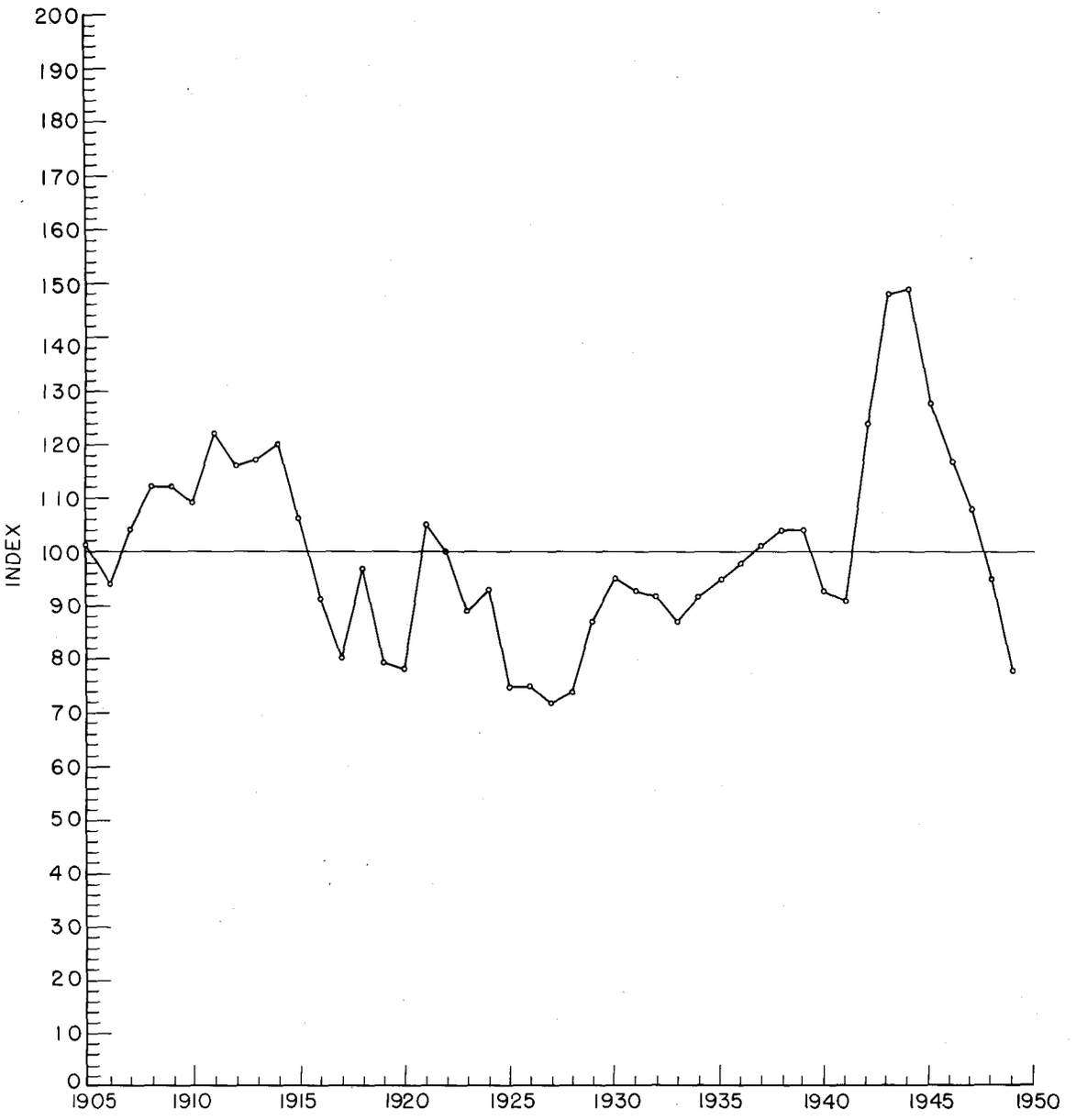

Figure 3 Index of Turnover in Superintendents with Fluctuations in Economic Conditions Removed.

effects turnover, but does suggest that any effect is gradual rather than immediate in the trend of turnover of school superintendents in Iowa.

V. REPLACEMENT

Turnover, as defined in this study, involved a superintendent leaving a position and being replaced by some other individual. No attempt has been made to ascertain the reasons for leaving, such as retirement, death, transfer to other states, transfer to educational positions other than superintendencies, transfer to other Iowa superintendencies, or permanent or temporary withdrawal from the profession.

The replacement aspect of turnover was chosen for special analysis in this study. Whenever a superintendent resigns he may be replaced (1) by someone who has never held an Iowa school superintendency, (2) by someone who has previously held an Iowa superintendency but who has not served in that capacity immediately before he became a replacement, and (3) by someone who has moved directly from another Iowa superintendency. For convenience, incoming superintendents have been designated from the foregoing classification as first entrant replacement, re-entrant replacement, and migrant replacement, respectively.

Because the data were available only from the annual directories the foregoing classification was made. Cards were made out for each of the 12,000 superintendent positions. These cards were then alphabetized according to superintendent's name in order that inspection would reveal in which group any given replacement should be classified.

Because no annual directory was used prior to the 1904-1905 school year an unknown number of superintendents have been classified as first entrants who should have been classified as re-entrants.

To avoid bias due to lack of earlier directories, the percentages of first entrant and re-entrant replacements have been adjusted for the first ten years of the series. This adjustment, prior to 1915, was made by dividing the sum of the first entrant and re-entrant replacement, in which no bias existed, into two parts on the basis of the linear trend in the ratio of the first entrants to re-entrants since 1915. No adjustments were made in the data since 1915, making the assumption mandatory that no superintendent re-entered after 1915 whose prior service was before the school year 1904-1905.

The percentages for each type of replacement in the Iowa school districts maintaining high schools are shown in Table 6 and Figure 4. An inspection of the data reveals a number of interesting observations which will be given further analysis.

A different type of analysis was made in terms of turnover in Table 7 and Figure 5, the percentages of the turnover which result in first entrant, re-entrant, and migrant replacement.

A. Schools With First Entrant Replacement

A first entrant replacement, as here defined, has never previously held an Iowa superintendency. He may have held a superintendency in some state other than Iowa. He may have been a principal or a classroom teacher in the same or some other school.

The extent to which Iowa school districts maintaining high schools have relied upon first entrants as a source of replacement is shown in Table 6 and Figure 6. During the 45-year period, on an annual average, one school in every

Table 6

PERCENTAGE OF SCHOOL DISTRICTS WITH VARIOUS AMOUNTS OF REPLACEMENT

Year	First Entrant	Migrant	Re-entrant	Year	First Entrant	Migrant	Re-entrant
1905	23.43	10.90	6.57	1930	12.34	10.59	4.26
1906	19.85	11.49	5.52	1931	10.37	7.53	3.82
1907	23.58	12.09	6.72	1932	9.83	5.13	3.38
1908	25.37	12.46	7.42	1933	8.60	4.90	3.37
1909	23.66	12.63	6.97	1934	9.16	6.43	3.60
1910	24.28	12.57	7.23	1935	8.94	8.83	3.05
1911	22.09	16.93	6.60	1936	8.83	9.05	3.27
1912	24.54	11.27	7.42	1937	9.38	9.38	3.93
1913	22.32	14.12	6.78	1938	9.04	8.61	2.72
1914	23.49	11.95	7.31	1939	8.40	8.29	2.94
1915	20.06	9.61	6.41	1940	8.52	7.10	1.86
1916	20.57	7.44	6.77	1941	8.22	7.02	3.40
1917	21.90	9.10	7.78	1942	8.15	13.33	6.72
1918	21.95	20.03	10.14	1943	10.33	18.22	7.56
1919	21.90	7.85	14.56	1944	10.47	18.02	7.21
1920	23.71	14.50	7.13	1945	7.54	16.91	6.06
1921	22.00	12.94	6.82	1946	7.10	13.74	9.90
1922	18.18	12.05	8.30	1947	7.30	19.20	6.36
1923	17.88	11.28	5.03	1948	9.03	14.85	5.70
1924	14.86	13.08	6.65	1949	6.35	11.27	4.92
1925	13.54	10.65	4.66	Average	15.08	11.22	5.93
1926	13.40	7.64	5.76				
1927	12.36	6.62	5.41				
1928	12.38	8.11	4.05				
1929	13.24	9.96	4.70				

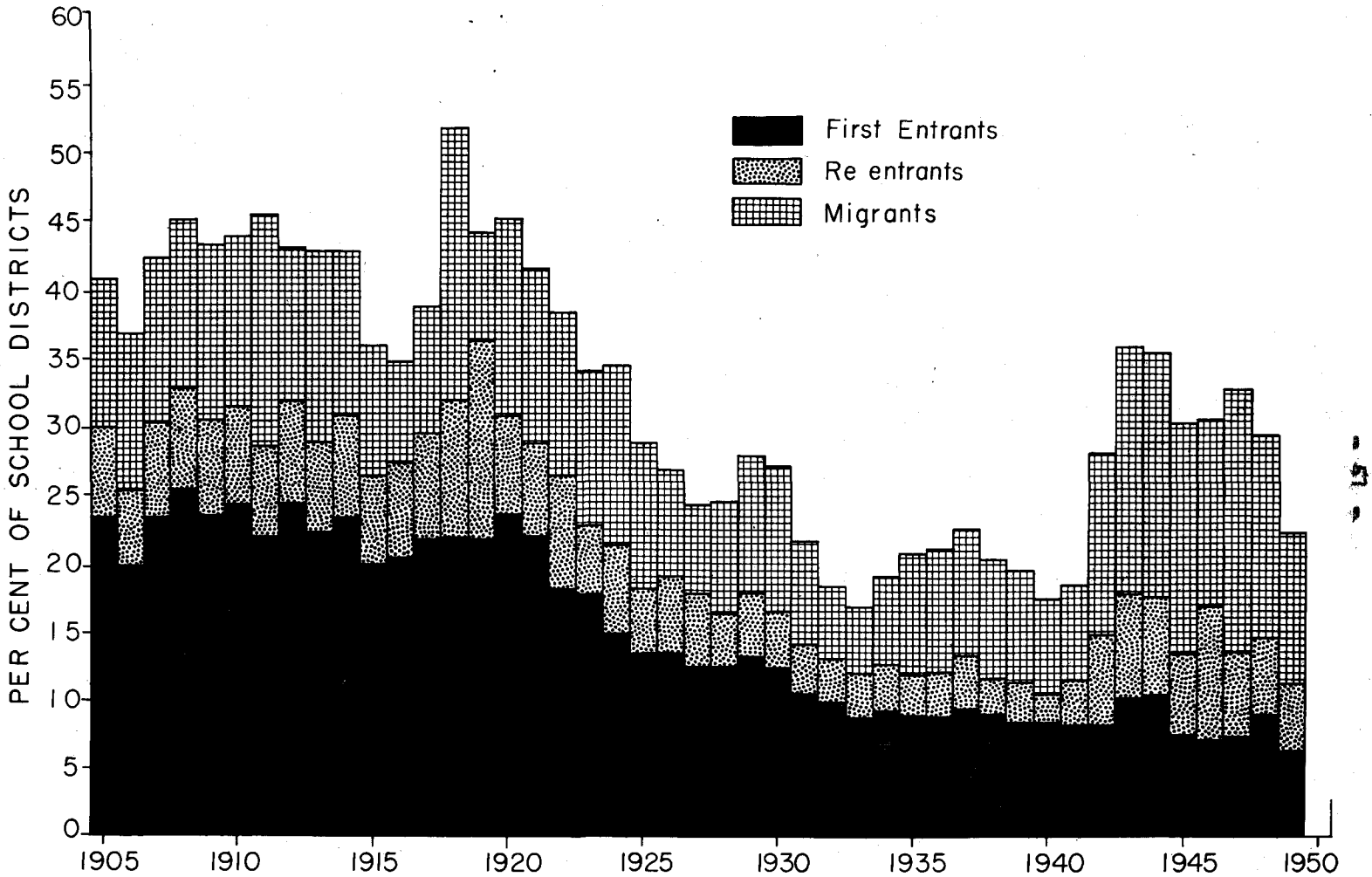

Figure 4 Percentage Iowa School Districts Classified According to Type of Replacement.

Table 7

TYPE OF REPLACEMENT OCCURRING IN TURNOVER
(Percentages)

Year	First Entrant	Migrant	Re-entrant	Year	First Entrant	Migrant	Re-entrant
1905	57	27	16	1930	45	39	16
1906	54	31	15	1931	48	34	18
1907	56	28	16	1932	54	28	18
1908	56	28	16	1933	51	29	20
1909	55	29	16	1934	48	33	19
1910	55	29	16	1935	43	42	15
1911	48	38	14	1936	42	43	15
1912	57	26	17	1937	41	42	17
1913	52	32	16	1938	44	43	13
1914	55	28	17	1939	43	42	15
1915	56	26	18	1940	49	40	11
1916	59	22	19	1941	44	38	18
1917	56	24	20	1942	29	47	24
1918	42	39	19	1943	29	50	21
1919	49	18	33	1944	29	51	20
1920	52	32	16	1945	25	55	20
1921	53	31	16	1946	23	45	32
1922	47	31	22	1947	22	59	19
1923	52	33	15	1948	31	50	19
1924	43	38	19	1949	28	50	22
1925	47	37	16				
1926	50	29	21				
1927	51	27	22				
1928	50	33	17				
1929	47	36	17				

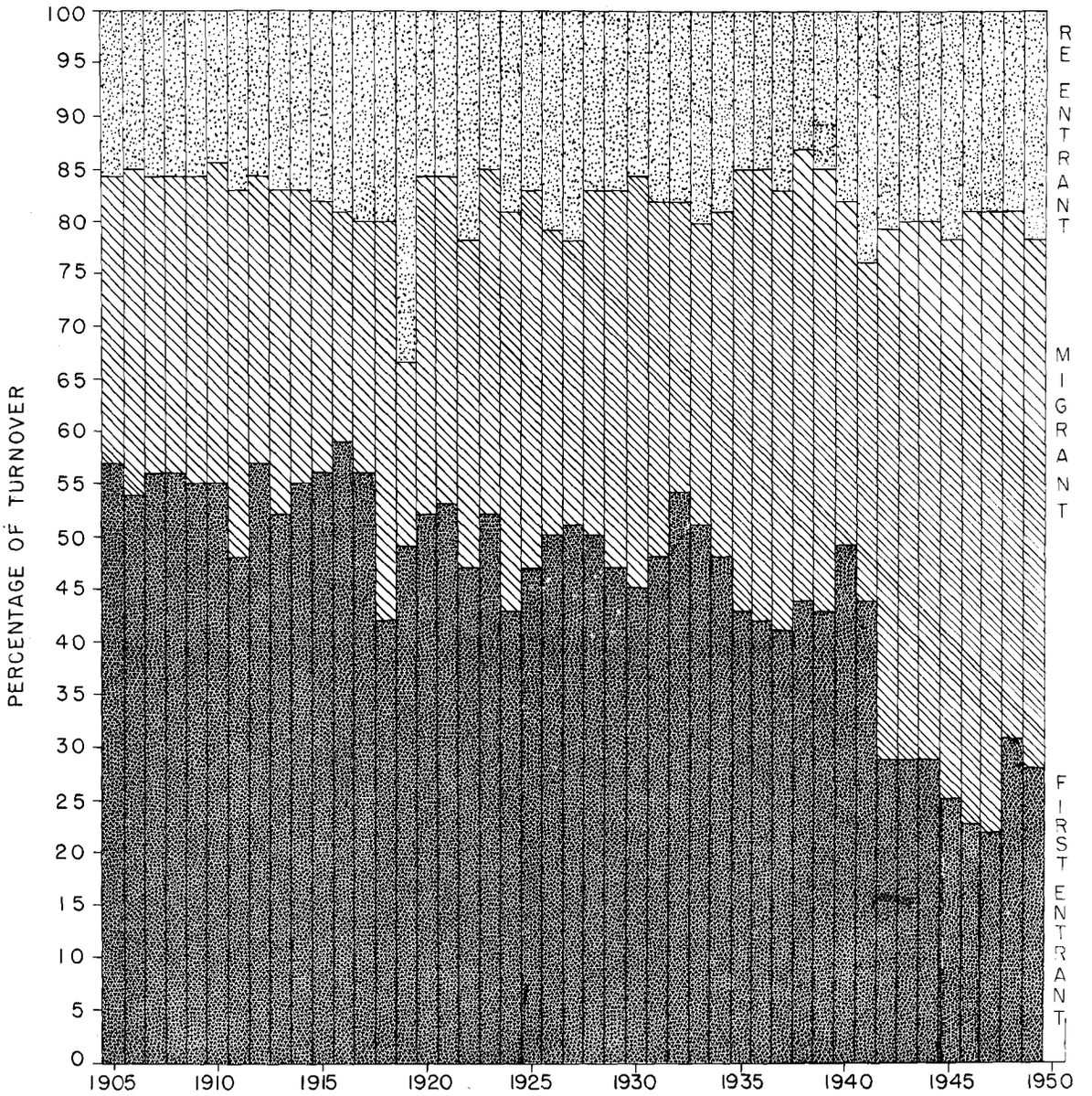

Figure 5 Percentage of Turnover Classified According to Type of Replacement.

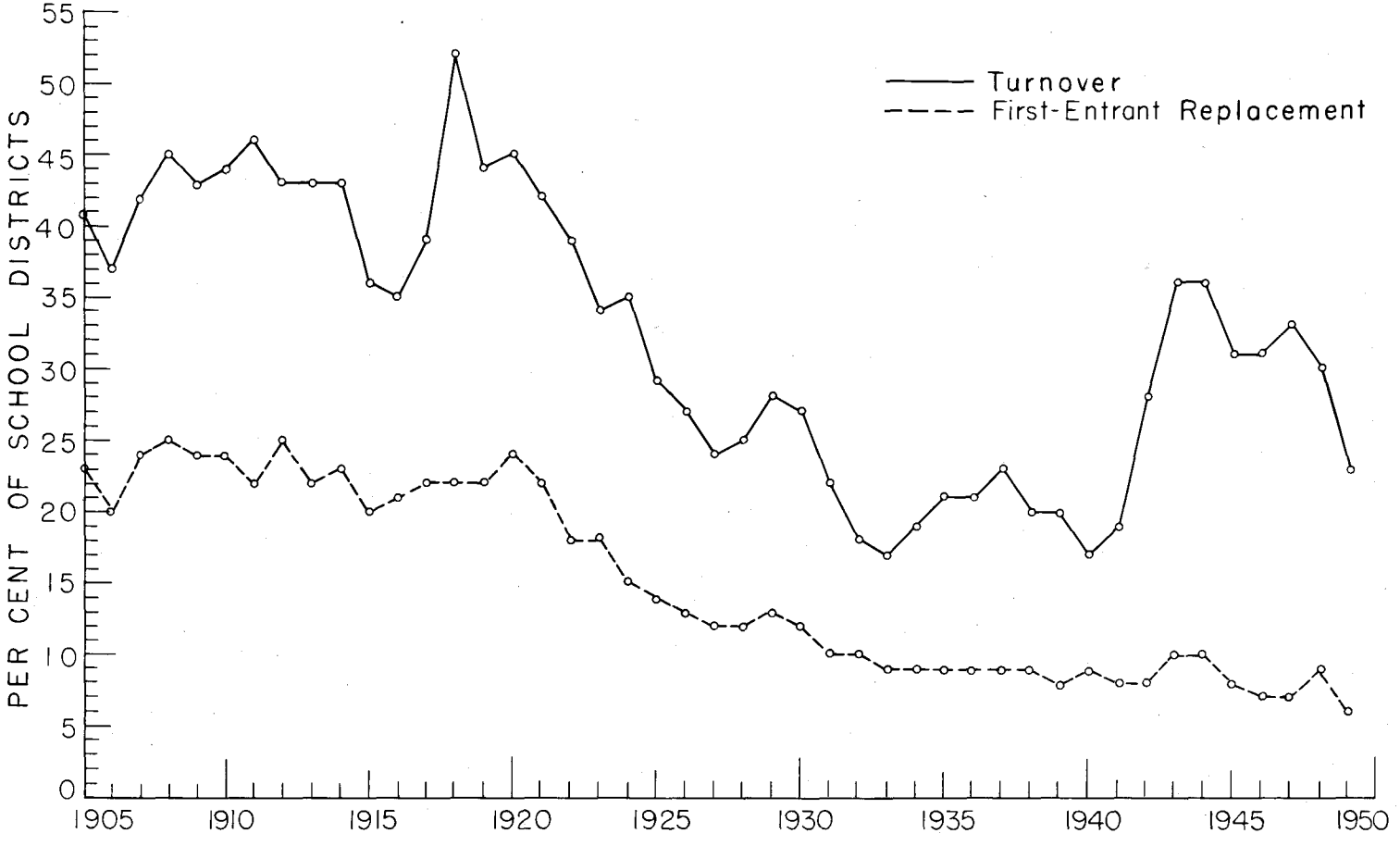

Figure 6 Percentage of Turnover and First Entrant Replacement.

seven began the school year with a superintendent who had no prior experience as an Iowa school superintendent. The extremes occurred during 1912 and 1949 when one in every four schools and one in every sixteen schools, respectively, employed a first entrant.

An inspection of the trend in first entrant replacement indicates a rapid decline in the demand for first entrants. It is necessary to go back almost 30 years before the percentage of schools employing a new superintendent is as large as the average for the 45-year period.

Some first entrant replacement is necessary if for no reason other than replacement due to death and retirement. An attempt to determine a secular trend for the 45-year series, if such a trend line is to be used for purpose of extrapolation in the future, must consider some irreducible minimum below which the percentage of schools employing first entrant replacement cannot fall.

For the purpose of this study it was assumed, quite arbitrarily, that this irreducible minimum is 5 per cent. The desired curve, then, was one which would be asymtotic

to 5 per cent such as

$$\log (Y-5) = aX + k$$

where Y = percentage of new entrant replacement

X = any year minus 1927

When the foregoing values of a and k were found by the method of least squares the ensuing equation was

$$\log (Y-5) = 0.8920755 - 0.0239679X$$

The percentages of schools requiring first entrant replacement as predicted from the trend equation is shown in Table 8, varying from 31.27 per cent in 1905 to 7.32 per cent in 1949. If this trend equation should be extrapolated into the future, the demand for first entrant replacements under the assumption of approximately 850 Iowa school districts maintaining high schools is as follows:

Year	Per cent	N
1951	7.07	60
1960	6.26	53
1970	5.73	49

Table 8

PERCENTAGE OF IOWA SCHOOLS WITH FIRST ENTRANT REPLACEMENT

Year	A	B	C	D	E	Year	A	B	C	D	E
1905	23.43	31.27	73	92	79	1930	12.34	11.61	104	98	106
1906	19.85	29.86	65	91	71	1931	10.37	11.25	90	88	102
1907	23.58	28.53	81	94	86	1932	9.83	10.92	88	82	106
1908	25.37	27.26	91	94	97	1933	8.60	10.60	79	81	98
1909	23.66	26.07	89	94	95	1934	7.16	10.30	87	85	102
1910	24.28	24.93	95	97	98	1935	8.94	10.02	87	87	100
1911	22.09	23.87	91	94	97	1936	8.83	9.75	89	88	101
1912	24.54	22.85	105	94	111	1937	9.38	9.50	97	90	107
1913	22.32	21.89	100	95	105	1938	9.04	9.25	96	85	112
1914	23.49	20.98	110	94	116	1939	8.40	9.02	91	84	107
1915	20.06	20.13	98	93	105	1940	8.52	8.81	95	84	112
1916	20.57	19.31	104	100	104	1941	8.22	8.60	94	88	106
1917	21.90	18.55	116	118	98	1942	8.15	8.41	95	95	100
1918	21.95	17.82	121	127	95	1943	10.33	8.23	123	99	123
1919	21.90	17.13	125	132	95	1944	10.47	8.05	127	100	126
1920	23.71	16.48	141	137	103	1945	7.54	7.89	94	100	94
1921	22.00	15.86	136	108	125	1946	7.10	7.73	90	107	84
1922	18.18	15.28	116	107	107	1947	7.30	7.59	94	118	80
1923	17.88	14.73	119	109	108	1948	9.03	7.45	119	121	98
1924	14.86	14.20	103	107	96	1949	6.35	7.32	85	115	74
1925	13.54	13.71	97	110	88						
1926	13.40	13.24	99	107	93						
1927	12.36	12.80	95	104	91						
1928	12.38	12.38	98	104	94						
1929	13.24	11.98	108	103	105						

A = Percentage of Schools With First Entrant Replacement
B = Secular Trend
C = Secular Trend Removed (45-year average = 100)
D = Index of Economic Conditions (σ = 13.39) (45-year average = 100)
E = Economic Conditions Removed (45-year average = 100)

The implication of the demands for first entrant replacement are of particular interest to teacher education in terms of superintendent certification.

Three Iowa institutions, State University of Iowa, Iowa State College, and Drake University, have undertaken the graduate education for certification. Much of this education is identical with that required for certification, or desirable for promotion, for high school principals who have previously completed the needed higher education. The graduate student load cannot be arrived at by the addition of demands for first entrants to those for high school principals on whatever basis the latter could be estimated.

Evidence from this study is too fragmentary for pointing out definite implication to the three institutions involved in graduate education in the area of school administration. On the other hand, the demand for first entrant replacement for in-service training to bring those on the job up to rising qualification standards, with few exceptions, has been met.

The secular trend during the 45-year period has been downward for the demand for first entrant replacements, whereas the trend of business conditions, as indicated by indexes, has been upward. The secular trend was removed from first entrant replacement and is shown in Table 8. A three-year moving-average of this replacement was made and the standard deviation found to be 13.39. The economic index, from which secular trend has been removed and shown in Table 1, was adjusted so that the series has a standard deviation of 13.39 and a 45-year average of 100. The resulting economic index is shown in Table 8. The coefficient of correlation between first entrant replacement and economic conditions was 0.66 when identical years were paired. Correlation with one year's replacement paired with that of the next, or prior, year's economic index produced no evidence of lead or lag. The positive correlation of 0.66 indicates considerable tendency for the demand for first entrants to increase with better economic conditions and decrease during entrance to depression periods. More than 40 per cent of the variance in demand for first entrants can be accounted for by economic conditions.

The first entrant replacement index was divided by the economic index in order to bring into relief fluctuation in first entrant replacement not associated with economic condition. The resulting index, adjusted to a 45-year average of 100, is shown in Table 8 and graphically in Figure 7.

The demand for first entrants was higher than economic conditions suggested during the years of World War II and has declined rapidly in the post-war years. No hypotheses are advanced for the greater demand than economic conditions suggest during the period from 1912 to 1916 and again during the early 1920's.

B. Turnover With First Entrant Replacement

In the previous discussion, the percentages of Iowa schools with first entrant replacement have been utilized. Another equally important analysis consists of noting the part which first entrant replacement plays in whatever turnover occurs. The data used are the percentages of turnover in which first entrant replacement ensues. These percentages are shown in Table 7 and again in Table 9.

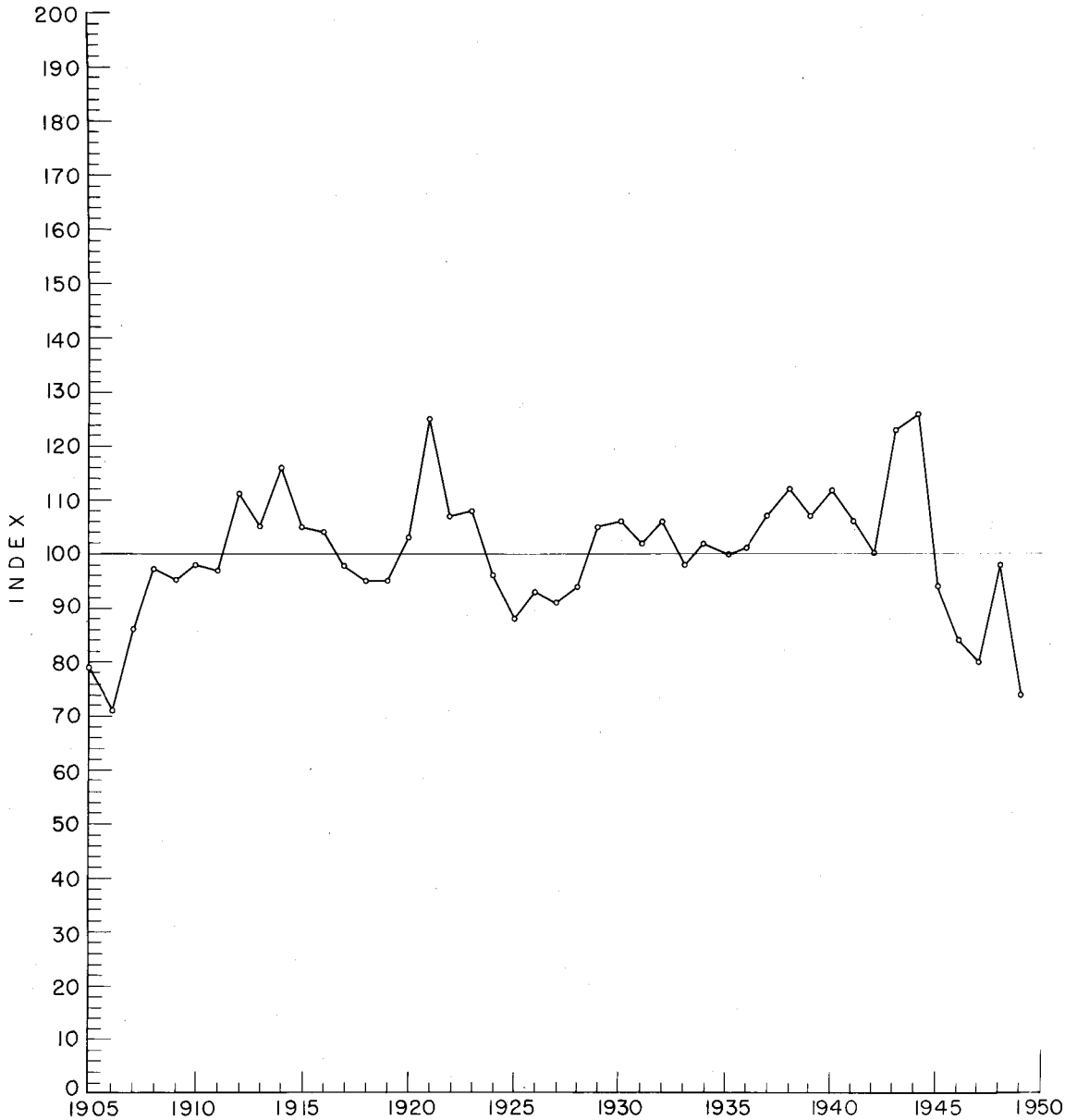

Figure 7 Index of Percentage of Schools having First Entrant Replacement with Fluctuations in Economic Conditions Removed.

Table 9

PERCENTAGE OF TURNOVER WITH FIRST ENTRANT REPLACEMENT

Year	A	B	C	D	Year	A	B	C	D
1905	57	95	107	88	1930	45	102	97	104
1906	54	91	107	84	1931	48	111	102	108
1907	56	96	107	89	1932	54	127	110	114
1908	56	97	104	92	1933	51	121	116	103
1909	55	96	104	91	1934	48	116	117	98
1910	55	97	105	91	1935	43	106	113	93
1911	48	86	103	82	1936	42	105	111	94
1912	57	103	105	97	1937	41	104	110	94
1913	52	95	104	90	1938	44	113	108	104
1914	55	102	104	97	1939	43	113	113	99
1915	56	105	105	99	1940	49	130	114	113
1916	59	112	105	106	1941	44	119	114	103
1917	56	107	100	106	1942	29	80	110	72
1918	42	81	84	95	1943	29	81	104	77
1919	49	96	75	126	1944	29	83	101	81
1920	52	103	70	145	1945	25	73	100	72
1921	53	107	65	162	1946	23	68	100	62
1922	47	96	92	103	1947	22	67	94	70
1923	52	107	94	113	1948	31	96	84	113
1924	43	90	92	97	1949	28	88	80	109
1925	47	100	93	107					
1926	50	108	91	117					
1927	51	111	94	117					
1928	50	111	96	115					
1929	47	105	96	108					

A = Percentage of Turnover With First Entrant Replacement
B = Secular Trend Removed (45-year average = 100)
C = Index of Economic Conditions (σ = 12.14) (45-year average = 100)
(Low values = High level)
D = Economic Conditions Removed (45-year average = 100)
(Replacement lag = 1 year)

The largest percentage of turnover with first entrant replacement occurred in 1916 with 59 per cent noted. The smallest percentage, 22 per cent, occurred in 1947. An inspection of the data, furthermore, suggests that the part which first entrants play in turnover has been rapidly decreasing during the 45 years.

The secular trend was determined by the method of least squares with the assumption of linear trend. The trend equation found was

$$Y = 45.93 - 0.64X$$

where Y = percentage of turnover with first entrant replacement

X = number of years since 1927

As seen from this equation, on an average, each succeeding year, approximately two-thirds of one per cent decrease, is shown in the part which new entrants play in turnover.

It was previously shown that turnover during the past 45 years has been gradually decreasing and now it is noted that the part new entrant replacement played in turnover is

rapidly becoming smaller. Judging from available evidence from this 45-year study, future demands for new entrants will continue to decrease. This decreasing demand for first entrant replacement may be a reflection of longer life tenure of Iowa school superintendents.

The secular trend was removed by dividing the percentages of turnover by the predicted percentages from the trend equation and adjusted in the usual manner. The series was correlated with the economic index and the highest relationship was found when the percentages of turnover lagged the economic indexes by one year. The coefficient of correlation was found to be -0.45. This negative correlation indicates that when secular trends are eliminated, the higher the economic conditions the smaller the part new entrant replacement plays in turnover. The size of the correlation shows that approximately 20 per cent of the variance in the percentages of first entrant in turnover may be accounted for by variations in economic conditions.

The standard deviation of three-year moving-averages for the series was found to be 12.14. To remove the

economic conditions from the series the economic index from 1904 to 1948 was adjusted so that the smaller the index the higher the economic conditions. The standard deviation was found equal to 12.14 and the 45-year average equal to 100. The adjusted index, shown in Table 9, was divided into the indexes for percentages of turnover with first entrant to remove fluctuations associated with economic changes. The resultant series is shown in Table 9 and Figure 8.

C. Schools With Re-Entrant Replacement

Re-entrant replacement, as defined in this study, occurs whenever an incoming superintendent has previously held an Iowa superintendency, but has not served in that capacity immediately before he became a replacement.

Re-entrant replacement, on first thought, may appear undesirable. Such replacement, however, may occur as a result of (1) professional advancement from an Iowa school to an out-of-state school and back to an Iowa superintendency, (2) small town superintendency to large city high school principalship to large city school superintendency,

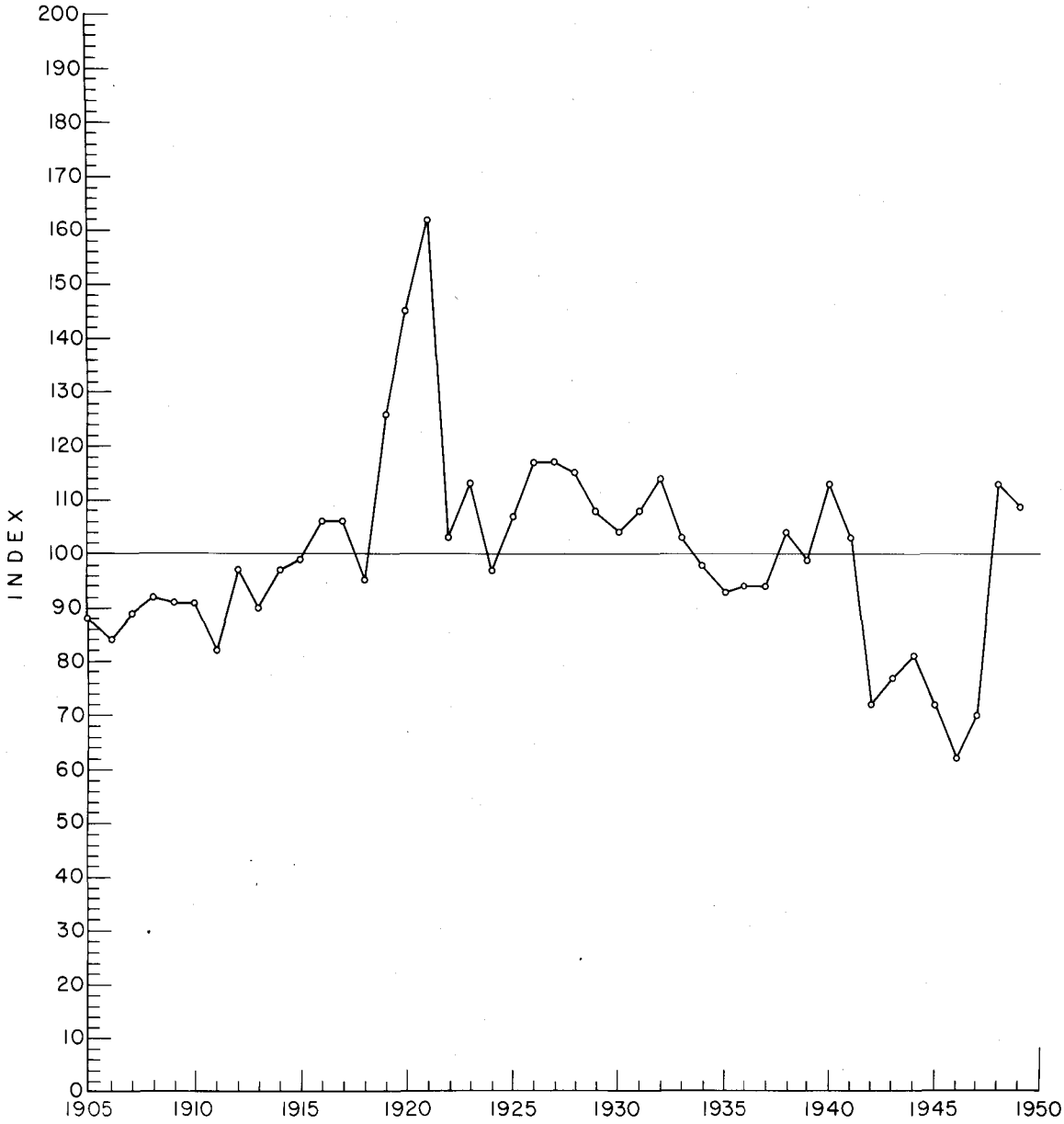

Figure 8 Index of Percentage of Turnover Resulting in First Entrant Replacement with Fluctuations in Economic Conditions Removed.

and (3) a year or more of university study. On the other hand it is well known, although no evidence was here available, that some undesirable re-entrant replacement may occur when acute shortages of personnel exist in times of war or inequality of salary balance between education and other aspects of the national economy. It is well known, also, some superintendents temporarily have left the profession to farm, sell insurance, and follow other occupational pursuits.

No attempt has been made here to segregate and analyze the various reasons for re-entrant replacement, some of which is desirable and some undesirable from the standpoint of the total educational program.

The percentage of schools employing a re-entrant replacement is shown in Table 6 and in Figure 9 for each of the 45 years. Annually, for the entire period, one school in every sixteen employed a re-entrant. The smallest percentage of schools employing re-entrants was 1.86 per cent in 1940 and the largest percentage was 14.56 per cent in 1919. Whether the secular trend was upward or downward is not apparent from an inspection of the series.

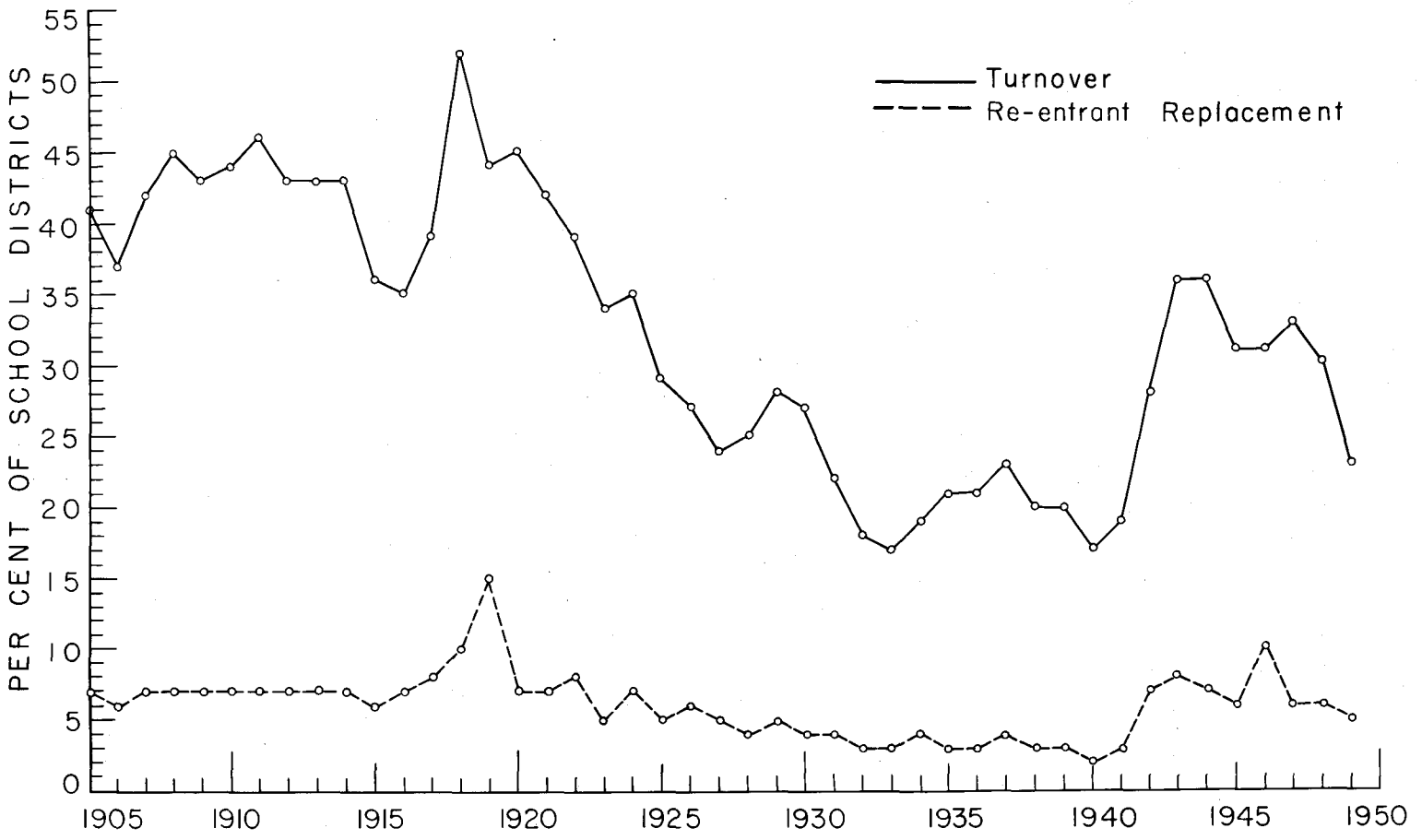

Figure 9 Percentage of Turnover and Re-Entrant Replacement.

A trend line was determined by the method of least squares and found to be

$$Y = 5.928 - 0.0639X$$

where Y = percentage of schools with re-entrant replacement

X = year since 1927

Thus it can be seen that the decrease in percentage of schools employing re-entrants is approximately one-sixteenth of one per cent annually. For all practical purposes, there is no long time upward or downward trend.

Fluctuations in the re-entrant series, however, indicate clearly the greater tendency to employ re-entrants during periods of prosperity, as well as during war periods. The secular trend was removed in the usual manner and the standard deviation of 33.77 was found for the three-year moving-averages. The economic indexes shown in Table 1 were adjusted to a standard deviation of 33.77 and are shown in Table 10.

The coefficient of correlation between percentage of schools employing re-entrant replacement and economic

Table 10

PERCENTAGE OF IOWA SCHOOLS WITH RE-ENTRANT REPLACEMENT

Year	A	B	C	D	E	Year	A	B	C	D	E
1905	6.57	7.33	90	78	113	1930	4.26	5.74	74	94	77
1906	5.52	7.27	76	77	97	1931	3.82	5.67	67	69	95
1907	6.72	7.21	93	85	107	1932	3.38	5.61	60	53	111
1908	7.42	7.14	104	86	119	1933	3.37	5.54	61	51	118
1909	6.97	7.08	98	84	115	1934	3.60	5.48	66	61	107
1910	7.23	7.01	102	92	109	1935	3.05	5.42	56	68	80
1911	6.60	6.95	95	84	111	1936	3.27	5.35	61	69	86
1912	7.42	6.89	108	86	123	1937	3.93	5.29	74	74	98
1913	6.78	6.82	99	87	112	1938	2.72	5.23	52	61	83
1914	7.31	6.76	108	85	124	1939	2.94	5.16	57	58	96
1915	6.41	6.69	96	82	115	1940	1.86	5.10	36	59	60
1916	6.77	6.63	103	100	101	1941	3.40	5.03	68	70	95
1917	7.78	6.57	118	146	79	1942	6.72	4.97	135	87	152
1918	10.14	6.50	155	170	89	1943	7.56	4.91	153	98	153
1919	14.56	6.44	224	182	121	1944	7.21	4.84	149	99	147
1920	7.13	6.38	112	196	56	1945	6.06	4.78	127	100	124
1921	6.82	6.31	108	121	87	1946	9.90	4.71	208	117	174
1922	8.30	6.25	133	118	111	1947	6.36	4.65	137	146	92
1923	5.03	6.18	81	122	65	1948	5.70	4.59	124	155	78
1924	6.65	6.12	109	118	90	1949	4.92	4.52	109	139	76
1925	4.66	6.06	77	125	61						
1926	5.76	5.99	96	118	79						
1927	5.41	5.93	91	111	80						
1928	4.05	5.86	69	111	61						
1929	4.70	5.80	81	108	73						

A = Percentage of Schools With Re-Entrant Replacement
B = Secular Trend
C = Secular Trend Removed (45-year average = 100)
D = Index of Economic Conditions (σ = 33.77) (45-year average = 100)
E = Economic Conditions Removed (45-year average = 100)

conditions was found to be 0.65. No evidence could be found for lead or lag for either series. More than 40 per cent of the variance in percentages of schools employing re-entrants was associated with economic fluctuations. When these fluctuations were removed from the replacement series, as shown in Table 10 and Figure 10, the most apparent discrepancy from expected re-entrant replacement was during the years of World War II.

D. Turnover With Re-Entrant Replacement

In the previous discussion, the percentages of Iowa schools employing re-entrants have been used in the analysis. Another equally important analysis consists of the part re-entrant replacement plays in turnover. The needed data are the percentages of turnover in which re-entrant replacement ensues. These percentages are shown in Table 7 and again in the first column of Table 11. The two unusual years were 1919 with 33 per cent and 1946 with 32 per cent which probably resulted from men returning to professional service from military service. Other than these two unusual years, the percentage of turnover resulting in re-entrant replacement differs but little from 20 per cent.

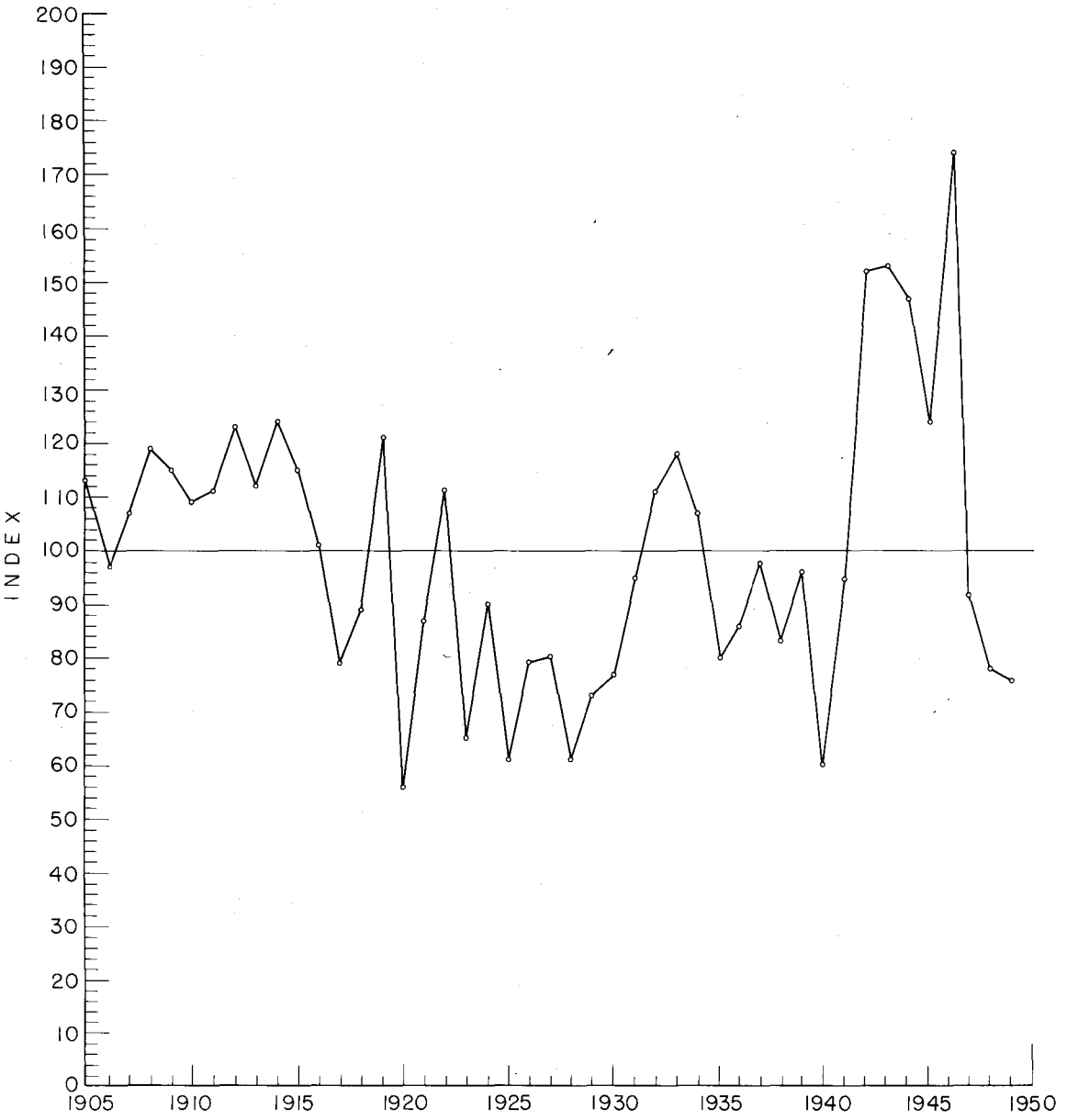

Figure 10 Index of Percentage of Schools having Re-Entrant Replacement with Fluctuations in Economic Conditions Removed.

Table 11

PERCENTAGE OF TURNOVER WITH RE-ENTRANT REPLACEMENT

Year	A	B	C	D	Year	A	B	C	D
1905	16	80	88	89	1930	16	88	98	89
1906	15	75	88	84	1931	18	99	84	116
1907	16	81	93	86	1932	18	100	75	131
1908	16	81	94	85	1933	20	112	74	149
1909	16	81	91	88	1934	19	106	79	132
1910	16	82	97	84	1935	15	85	83	100
1911	14	72	93	76	1936	15	86	84	100
1912	17	86	94	89	1937	17	96	86	110
1913	16	83	94	87	1938	13	75	60	123
1914	17	87	93	91	1939	15	86	78	108
1915	18	93	90	101	1940	11	64	79	80
1916	19	98	101	96	1941	18	104	84	122
1917	20	104	117	88	1942	24	140	94	147
1918	19	99	138	71	1943	21	123	100	121
1919	33	174	145	118	1944	20	117	100	115
1920	16	85	152	55	1945	20	118	101	115
1921	16	85	112	75	1946	32	190	110	170
1922	22	117	110	104	1947	19	113	125	89
1923	15	81	113	71	1948	19	114	128	88
1924	19	102	111	90	1949	22	132	121	107
1925	16	86	114	74					
1926	21	114	110	102					
1927	22	120	107	110					
1928	17	93	107	86					
1929	17	93	105	88					

A = Percentage of Turnover With Re-Entrant Replacement
B = Secular Trend Removed (45-year average = 100)
C = Index of Economic Conditions (σ = 17.87) (45-year average = 100)
D = Economic Conditions Removed (45-year average = 100)

Secular trend was determined by the method of least squares and the equation was found to be:

$$Y = 18.24 - 0.079X$$

where Y = percentage of turnover resulting in re-entrant replacement

X = years since 1927

As seen from this equation, on an average, the annual percentage reduction is so small that for all practical purposes no long-time upward or downward trend has occurred.

The secular trend, small though it was, was removed from the series and the resulting index was correlated with the economic index, yielding a coefficient of correlation of 0.40. No evidence indicated a lead or lag of either series. About 16 per cent of the variance in percentage of turnover resulting in re-entrant replacement has been associated with changes in economic conditions.

The series with variation associated with economic conditions removed is shown in Table 11 and graphically in Figure 11.

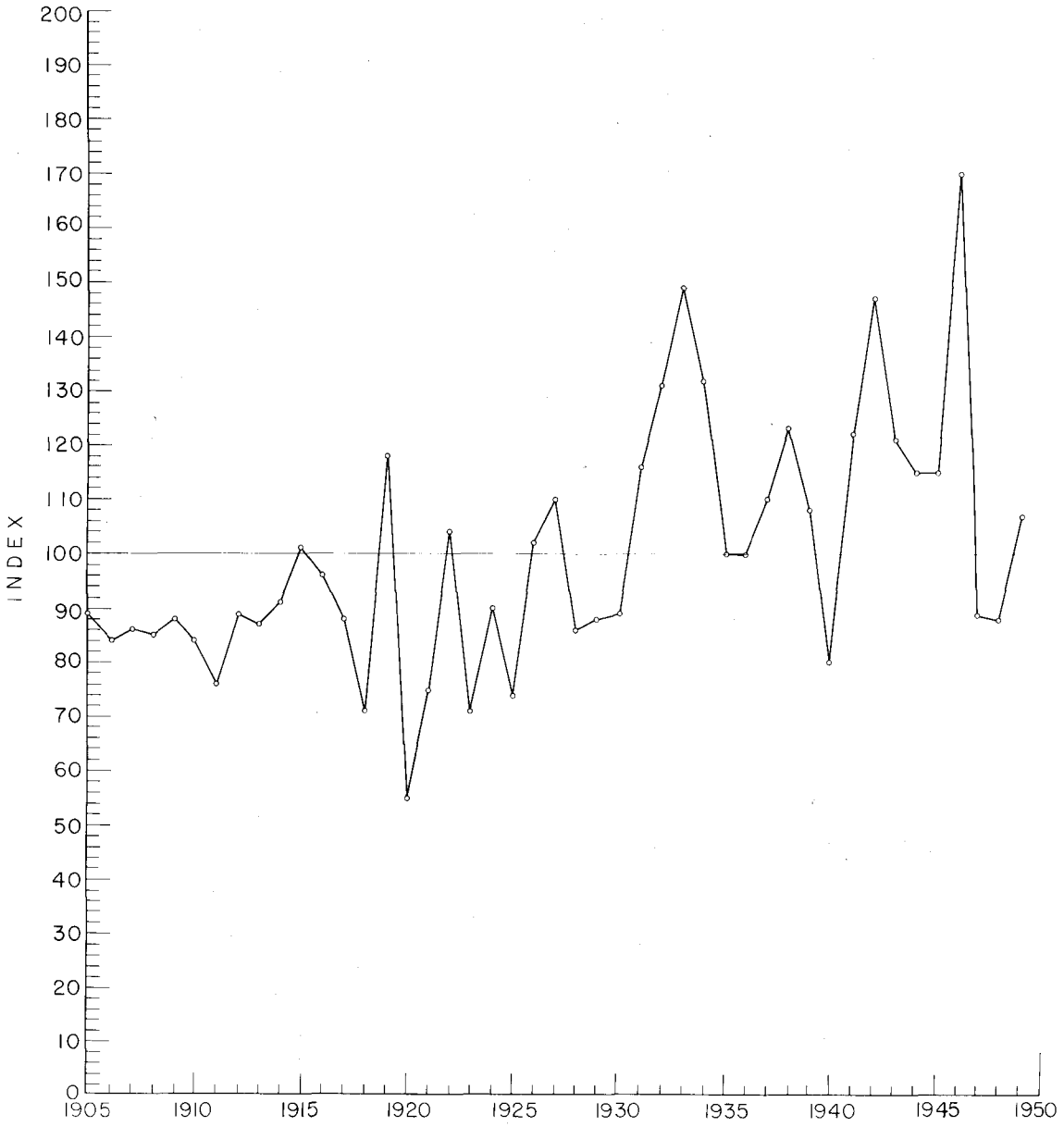

Figure 11 Index of Percentage of Turnover Resulting in Re-Entrant Replacement with Fluctuations in Economic Conditions Removed.

It is especially interesting to note that during the depression in the 1930's re-entrants played a greater part in turnover than would be expected from the economic indexes, low though they were during this period.

E. Schools With Migrant Replacement

A migrant replacement, as defined in this study, is one in which the incoming superintendent has moved directly from another Iowa superintendency. Thus he became the replacement without any intervening interruption in his career as an Iowa superintendent. The term migrant was chosen with considerable reluctance. It is not the purpose in this study to imply that migrant replacement, in itself, is either desirable or undesirable. Some migrant replacement results from professional advancement and, as such, can be assumed to be desirable. Other migrant replacement results from a mere changing from one school to another without ensuing professional advancement. The term migrant replacement as here used included all degrees of desirability from that dictated by a high degree of professional advancement to that associated with an administrative tramp such as

might be inferred from John Steinbeck's Grapes of Wrath. It has not been the purpose here to make any detailed study of the part professional advancement and professional vagrancy play in this migrant turnover. Such a detailed study belongs in a tenure study rather than a turnover study.

Although no attempt was made to make any analysis of professional advancement and professional vagrancy, the occurrence of each has been evident in individual cases. It may seem unduly harsh to apply the term of professional vagrant to anyone who has given a major portion of his productive life to the administration of Iowa schools. However, this viewpoint may be justified when reviewing the tenure of one superintendent who, during the last 37 years, had given 16 years of service in 14 different schools without any surface evidence of professional advancement throughout his career.

Changing administrative positions progressively from smaller to larger communities has often been thought of as professional advancement. This statement, in general, is true when professional advancement is measured in terms of salary or of prestige.

Some evidence was assembled to ascertain the amount professional advancement plays in turnover by an analysis of the turnover replacement in the city schools of Iowa since 1930.

In the 87 cities of Iowa, the turnover of superintendents during the past 30 years has been 181 as shown in Table 12. Of the 181 required replacements, 41 came directly

Table 12

TURNOVER REPLACEMENT IN IOWA CITIES SINCE 1930

Size of City	Number of Cities	Turnover	New Entrant		Last Position		
			Ranks	Other	City	Town	Farm
10000 or more	21	45	12	6	20	5	2
5000 - 9999	23	43	11	3	12	14	3
2500 - 4999	43	93	15	11	9	48	10
All Cities	87	181	38	20	41	67	15

from other city superintendencies, 67 from villages with over 500 population, and 15 from communities with less than

500 population. The remaining 58 replacements by definition are new entrants. Of this number 38 were promoted from within the school system. Those promoted were usually the high school principal or the assistant superintendent of schools. The remaining 20 men were not identified, but could consist of out-of-state replacements or principals of high schools in other districts who have never held an Iowa school superintendency.

Although a few cases were noted in which a superintendent has attained professional advancement to a city school district as a result of successive changes from the small to the large school, such a method of professional advancement has been far from universal practice. In fact, it apparently has been the exception rather than the rule.

The percentage of schools employing a migrant replacement varied from 4.90 per cent in 1933 to 20.03 per cent in 1918. This is shown in Table 6, graphically in Figure 12, and again in the first column of Table 13.

An inspection of the data suggested that the secular trend is slightly upward and related positively to economic fluctuations.

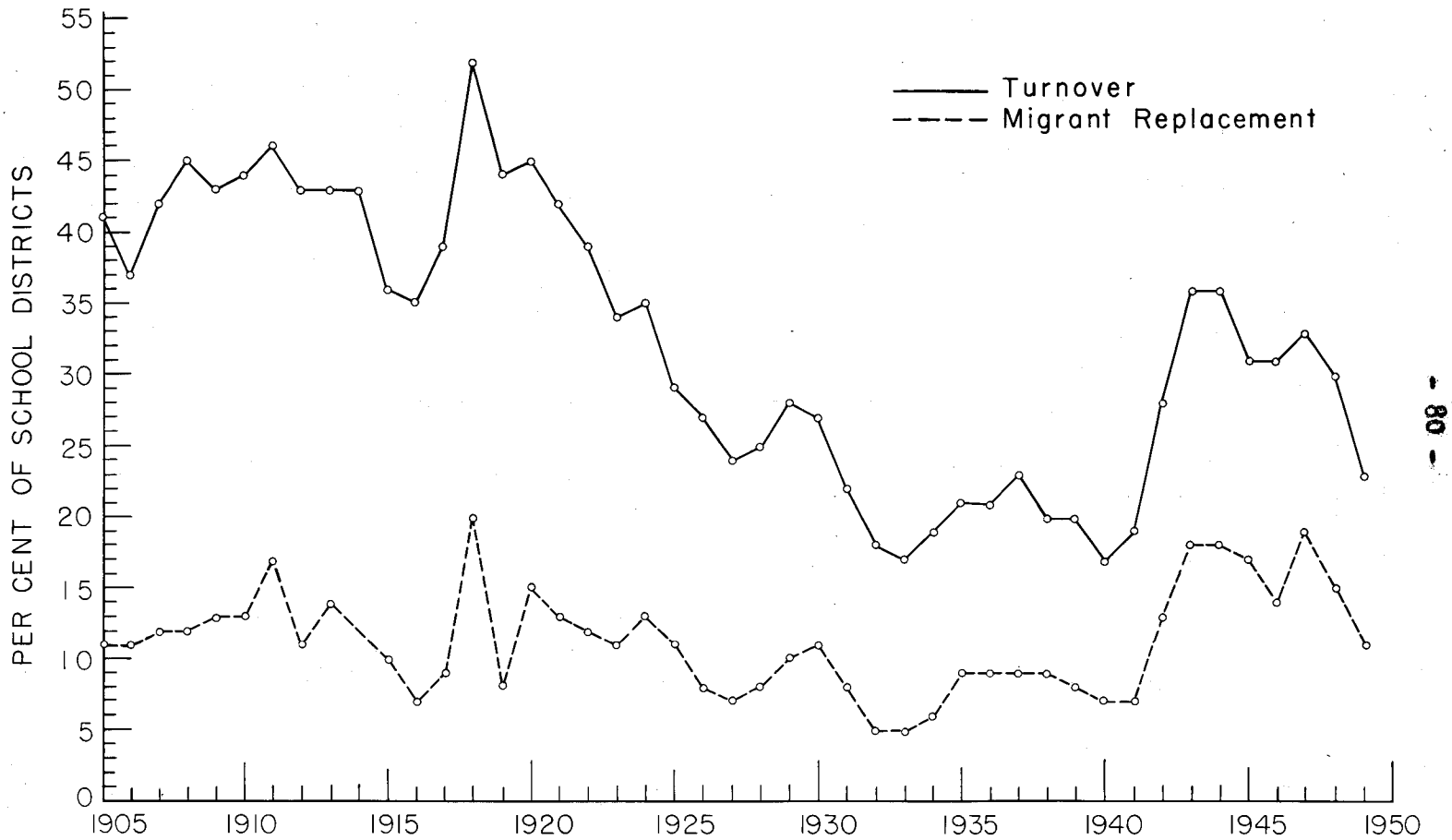

Figure 12 Percentage of Turnover and Migrant Replacement.

Table 13

PERCENTAGE OF IOWA SCHOOLS WITH MIGRANT REPLACEMENT

Year	A	B	C	D	E	Year	A	B	C	D	E
1905	10.90	11.09	98	82	117	1930	10.59	11.26	94	95	97
1906	11.49	11.10	104	82	124	1931	7.53	11.26	67	75	87
1907	12.09	11.10	109	88	121	1932	5.13	11.27	46	62	72
1908	12.46	11.11	112	89	123	1933	4.90	11.28	43	61	68
1909	12.63	11.12	114	87	128	1934	6.43	11.28	57	68	82
1910	12.57	11.12	113	94	117	1935	8.83	11.29	78	74	103
1911	16.93	11.13	152	87	171	1936	9.05	11.30	80	75	105
1912	11.27	11.14	101	89	110	1937	9.38	11.30	83	79	103
1913	14.12	11.14	127	90	138	1938	8.61	11.31	76	69	107
1914	11.95	11.15	107	88	119	1939	8.29	11.32	73	67	106
1915	9.61	11.16	86	86	98	1940	7.10	11.32	63	67	92
1916	7.44	11.16	67	100	65	1941	7.02	11.33	62	76	80
1917	9.10	11.17	81	137	58	1942	13.33	11.34	118	90	128
1918	20.03	11.18	179	156	112	1943	18.22	11.34	161	99	159
1919	7.85	11.18	70	166	41	1944	18.02	11.35	159	99	157
1920	14.50	11.19	129	177	71	1945	16.91	11.36	149	100	146
1921	12.94	11.20	115	117	96	1946	13.74	11.36	121	114	104
1922	12.05	11.20	108	114	93	1947	19.20	11.37	169	136	121
1923	11.28	11.21	101	117	84	1948	14.85	11.38	130	144	88
1924	13.08	11.22	116	115	99	1949	11.27	11.38	99	131	74
1925	10.65	11.22	95	120	77						
1926	7.64	11.23	68	114	59						
1927	6.62	11.24	59	109	53						
1928	8.11	11.24	72	109	65						
1929	9.96	11.25	89	106	82						

A = Percentage of Schools With Migrant Replacement
B = Secular Trend
C = Secular Trend Removed (45-year average = 100)
D = Index of Economic Conditions (σ = 27.15) (45-year average = 100)
E = Economic Conditions Removed (45-year average = 100)

The secular trend was determined by the method of least squares and found to be

$$Y = 11.234 + 0.00687X$$

where Y = percentage of schools having migrant replacement

X = years since 1927

If it can be assumed that mere changing of positions is not in interests of public education, then progress has not been made in this respect during the past 45 years.

The secular trend, small though it was, was eliminated from the series. The resulting series, with a three-year moving-average, had a standard deviation of 27.15. The economic index was adjusted to have an equal amplitude and is shown in Table 13.

The coefficient of correlation was computed between the economic index and the index of the percentage of schools with migrant replacement. This coefficient of correlation, 0.44, indicates that approximately 20 per cent of the variance in this replacement series is associated with

economic conditions. No evidence was found for lead or lag in either series.

For the purpose of bringing into relief the variation in the replacement series uneffected by economic conditions, the replacement series was divided by the economic series and the resulting series are shown in Table 13 and Figure 13. No hypothesis is here advanced for its extremely low index of 41 appearing in 1919, nor for the extremely high index for the year 1911. It does seem, however, that greater migrant activity was shown during World War II than would be expected from prevailing economic conditions.

F. Turnover With Migrant Replacement

In the previous discussion the percentage of schools with annual migrant replacement has been considered. Of equal interest is the part that migrant replacement plays in the annual turnover. The percentage of turnover resulting in migrant replacement is shown in Table 7 and again in the First column of Table 14.

The percentage of turnover resulting in migrant replacement was smallest in 1919 with 18 per cent, and greatest in

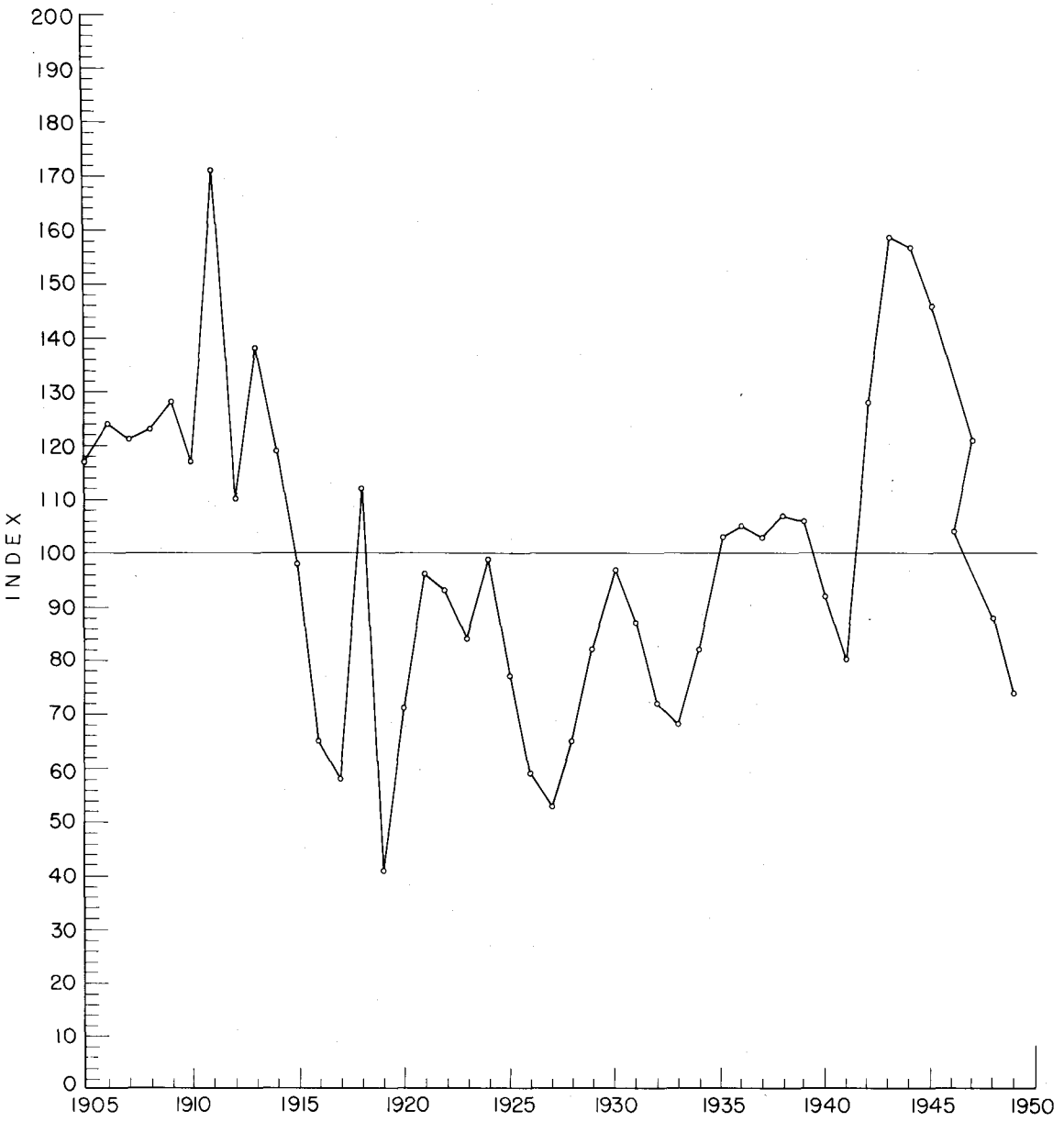

Figure 13 Index of Percentage of Schools having Migrant Replacement with Fluctuations in Economic Conditions Removed.

Table 14

PERCENTAGE OF TURNOVER WITH MIGRANT REPLACEMENT

Year	A	B	C	Year	A	B	C
1905	27	115	92	1930	39	104	98
1906	31	129	92	1931	34	88	89
1907	28	114	95	1932	28	71	83
1908	28	111	95	1933	29	73	83
1909	29	113	94	1934	33	82	86
1910	29	110	97	1935	42	104	88
1911	38	142	94	1936	43	105	89
1912	26	95	96	1937	42	101	91
1913	32	114	95	1938	43	102	86
1914	28	98	94	1939	42	99	85
1915	26	88	94	1940	40	92	86
1916	22	73	100	1941	38	86	89
1917	24	78	116	1942	47	106	95
1918	39	127	125	1943	50	112	99
1919	18	57	129	1944	51	112	100
1920	32	100	134	1945	55	120	100
1921	31	96	108	1946	45	97	106
1922	31	94	106	1947	59	125	116
1923	33	98	108	1948	50	105	120
1924	38	111	107	1949	50	104	114
1925	37	107	109				
1926	29	81	106				
1927	27	74	104				
1928	33	90	104				
1929	36	97	103				

A = Percentage of Turnover With Migrant Replacement
B = Secular Trend Removed (45-year average = 100)
C = Index of Economic Conditions (σ = 12.07) (45-year average = 100)

1947 with 59 per cent. In general the part which migrant replacement plays in turnover has been increasing during the 45-year period.

The secular trend, found by the method of least squares, was

$$Y = 35.82 + 0.5609X$$

where Y = percentage of turnover with migrant replacement

X = years since 1927.

From the trend equation it is apparent that the percentage of turnover resulting in migrant replacement has been increasing, on an average, a little more than one-half of one per cent each year.

The secular trend was removed from the series in the usual manner and the indexes are shown in Table 14. Correlation of this series with the economic index yielded a coefficient of correlation of approximately zero. Apparently the percentage of turnover resulting in migrant replacement is not effected by economic conditions.

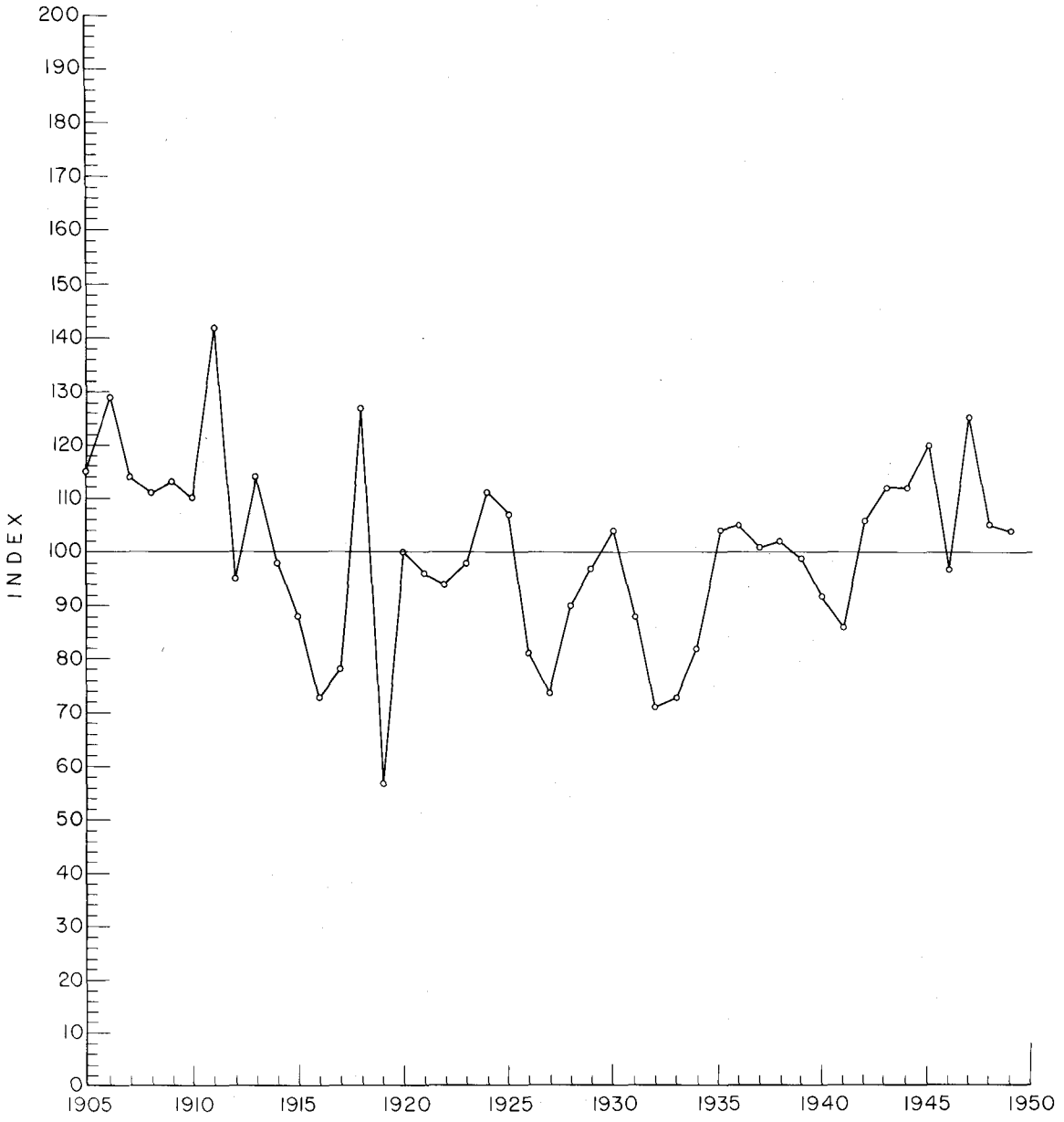

Figure 14 Index of Percentage of Turnover Resulting in Migrant Replacement.

Because no relationship was found the indexes of turnover resulting in migrant replacement can be inspected directly from the second column in Table 14 or from the graphic representation in Figure 14. No hypotheses have been postulated which might account for the small variations from year to year.

From whatever viewpoint migrant replacement is analyzed, the implications for a sound program of education in Iowa are challenging.

VI. SUMMARY

For many years the problem of turnover in the business world has received careful consideration. In the field of public education few studies of turnover have been made. None was found in which information was assembled over a sufficiently long period of time that long-time trends could be studied in relation to changes of economic conditions.

The present study is a description of the historical information of the turnover of superintendents in Iowa school districts maintaining high schools, beginning with the school year 1905-1906 and ending with the school year of 1949-1950. Information was obtained from directories published annually by the State Department of Public Instruction.

An economic index was developed for the same period of years from available indexes of (1) cost of living, (2) wholesale prices, and (3) prices received by Iowa farmers.

The number of school districts maintaining high schools has varied from year to year with an average

between 800 and 900 districts. In the 45-year period between 35,000 and 40,000 superintendent-years of service were provided for the public schools of Iowa. This administrative service was rendered by approximately 6600 different individuals who have held more than 12,000 superintendent positions during the period studied.

The investigation, here reported, was a part of the Research Project 938 of the Vocational Education Section of the Iowa Agricultural Experiment Station.

Turnover was expressed in terms of percentages of schools in which a change of superintendents occurred as revealed by successive annual directories. Turnover varied from 52 per cent in 1918 to 17 per cent in 1933 with a 45-year average of 32 per cent.

Inspection of the data revealed a downward secular trend during the 45 years. The turnover series was fitted by the method of least squares with the assumption of an irreducible minimum turnover of 10 per cent by an equation of the form

$$\log (Y-10) = aX + k$$

where Y = percentage turnover

X = years since 1927

The equation for secular trend was found to be

$$\log (Y-10) = 1.29794 - 0.10807X$$

The decrease in turnover as indicated by this secular trend, on an average, was approximately one-half of one per cent.

Variations from trend indicated a small turnover in depression periods and a large turnover in war periods, particularly in World War II. When economic conditions were removed from the variations from trend, no apparent reasons could be advanced for the resulting variations. If such factors as school legislation, school consolidation, and inaugerations of other educational programs are related to turnover, their effects must be gradual rather than immediate.

Whenever turnover occurs, the replacement may be (1) someone who has never held an Iowa school superintendency, (2) someone who has previously held an Iowa superintendency

but who has not served in that capacity immediately before he became a replacement, and (3) someone who has moved directly from another Iowa superintendency. These replacements, for convenience, have been designated as first entrant replacement, re-entrant replacement, and migrant replacement, respectively.

The absolute number of first entrants needed for replacement has been rapidly decreasing during the 45 years studied. It appears from the secular trend that approximately 50 superintendents who are first entrants will be needed annually during the next 10 years for approximately 850 Iowa school districts maintaining high schools.

The part that first entrant replacement plays in turnover has averaged 46 per cent during the 45-year period. The annual decrease has averaged approximately two-thirds of one per cent annually.

Re-entrant replacement has occurred, on an average, 6 per cent annually. No particular long-time change was noted, but greater replacement of this type was noted during war periods. There has been some relationship noted to

periods of prosperity and depression with the smaller re-entrant replacement having been found in the latter.

Migrant replacement, on an average, has annually occurred in 11 per cent of the Iowa school districts maintaining high schools. An analysis of the secular trend revealed, for all practical purposes, neither an upward or downward secular trend during the period studied.

When turnover has occurred, succeeding years, on an average, shows percentage of such annual turnover resulting in migrant replacement. The increase, on an average, has been more than one-half of one per cent annually. During the past 10 years more than one-half of all Iowa turnover has resulted in migrant replacement.

Although it was beyond the purpose of this study to ascertain the desirable minimum migrant replacement, the amount of such replacement shown in the Iowa schools has far exceeded a desirable minimum. Furthermore an analysis of the secular trend revealed little or no evidence of improvement in the immediate future.

Of all the problems here studied dealing with turnover and the various types of replacement, the problem of migrant replacement appears most acute and constitutes a direct challenge for public education in Iowa.

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